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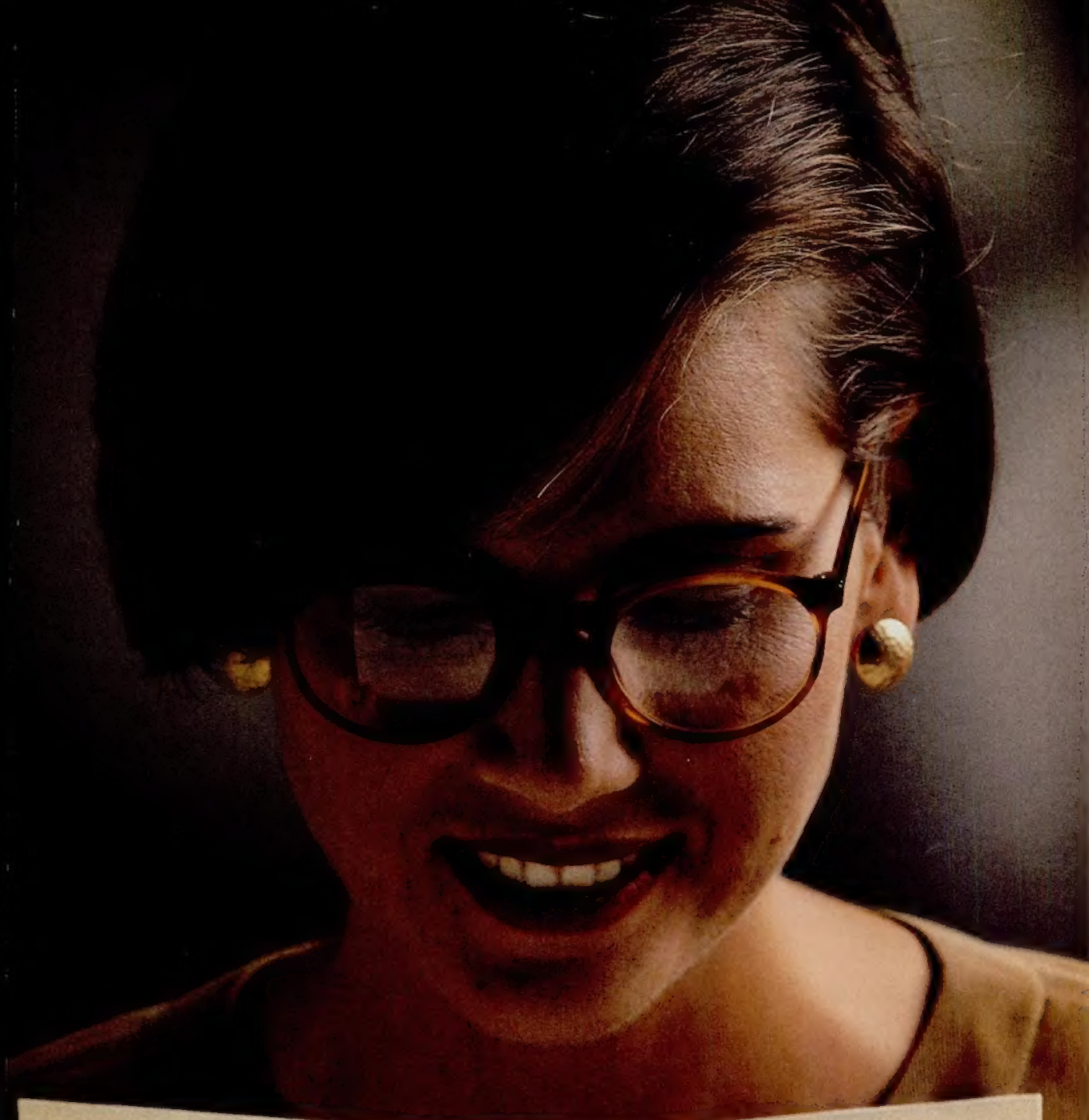


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CIRCLE 105 ON READER SERVICE CARD

Inside

In this issue we focus on two technologies that will affect your computing life in the very near future. One is the subnotebook computer. Yes, just when you thought the 6- to 7-pound laptop had established itself as a standard, manufacturers are shrinking

the standard yet again.

The new machines, sometimes described as "Gideon-size" after the ubiquitous hotel Bibles, are a triumph of miniaturization. The early models weigh 4 pounds or less, offer keyboards decent enough to use for real work, and promise battery life that will keep you plunking for several hours on a plane.

No single breakthrough is responsible for this next-generation of machines. Smaller hard disks,

ing Subnotebook" explains how all the pieces fit together to make the smallest PCs that let you do real work. We also point out the tradeoffs, another inevitability when a new technology is introduced.

The other technology we spotlight in this issue is video. The shift to graphical user interfaces has put a real strain on traditional PC video technologies. What many of us perceive as the slowness of Windows is actually

the snail's pace of a video card trying to pour millions of pixels through a slow connector designed for simple text fonts. Going GUI means filling the screen with points of light and handling complex shapes in hundreds or even thousands of colors.

In pursuit of faster graphics, manufacturers have embraced a variety of new technologies. One of the most popular new buzzwords is *local-bus video*. In "Local-Bus

Technology: Video Takes a New Route," we explain what the term means, examine the various flavors, and look at some of the alternatives. If watching the hourglass is not your idea of computer fun, you'll want to read this story.—Joel Dreyfuss



PHOTOGRAPH BY RALPH MASULLO

Downsizing the notebook.

cleverer keyboard technology, denser chip sets, and smarter power management have all come together to create a new category of PC that really promises not to give you back strain.

Our story "Downsizing Notebook PCs: The Incredible Shrink-

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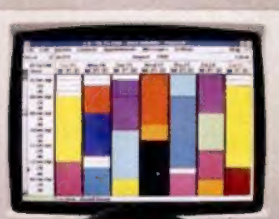
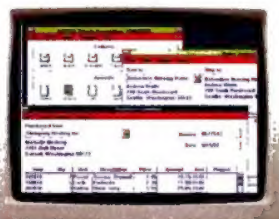
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CIRCLE 348 ON READER SERVICE CARD

How The Right Windows Comm Software Can Get Everybody Talking.

"If you think that using Windows means never having to open a reference manual, Crosstalk for Windows is the communications package for you."

-PC Magazine

"Product of the year."

-InfoWorld

"Best of the graphical communications packages."

-Software Digest

"...a well-designed Windows implementation full of icons that make it intuitive to operate."

-PC Magazine

Well, of course. That's the point of communications software. Communicating.

A sizeable number of people have been saying mighty good things about Crosstalk® for Windows. And more people are using Crosstalk for Windows to say good things than any other Windows™ comm program.

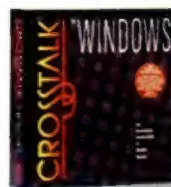
Listen To What They're Saying.

Recently, Crosstalk for Windows was named Editors' Choice in *PC Magazine's* Modern Communications Software Review. *Windows Magazine* gave it a Readers' Choice Award. And as you can see by the comments above, those are just a few of the awards and plaudits that have come our way.

Why All The Talk?

For one thing, Crosstalk for Windows' long-standing reputation as a mature, stable product. It has what *InfoWorld* called "tremendous connectivity options." The most popular protocols and emulations, like ZMODEM and VT™ 320. The ability to transfer data within Windows through Dynamic Data Exchange. As well as support for shared modems on LANs via NASI/NACS and INT14, for 16550A UARTs, and for speeds up to 57,600 bps.

It also includes a powerful scripting language to automate complex communications. And you can create those scripts through a Learn feature.



Now Hear This.

Along with a whole raft of intelligently designed features, Crosstalk for Windows comes with another extremely important element—excellent support.

In their recent review of Windows comm software, *InfoWorld* wrote that when they called us, their "calls were answered immediately by a capable and well-informed technician." On the other hand, they called the makers of Procomm Plus "more than 30 times in two weeks. All we ever got was a busy signal." With Crosstalk for Windows, you not only get a product that people talk about. You also get people to talk to if you need help.

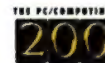
That's all we have room to say here. But if you'd like more information on product features or technical specs, just give us a call. Then try Crosstalk for Windows yourself. It'll get you talking for sure.

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Computers

Downsizing Notebook PCs: The Incredible Shrinking Subnotebook

BY CHRISTOPHER BARR Subnotebook computers, the newest class of portables, are finally here! We explain the breakthroughs in technology that make them possible, including advances in low-voltage processors, improved power management, PCMCIA cards, and downsized mass storage110

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Breaking the notebook mold:
Low-voltage processors, light-weight nickel hydride batteries, slimline hard disks, and credit card-size PCMCIA peripherals are changing the shape of portable computing.

Hardware**Local-Bus Technology:
Video Takes a New Route**

BY JOHN R. QUAIN When it comes to computer graphics, it's faster to take the local bus than the expansion bus. On a 486/33 local-bus PC, the video controller can match the 33-MHz clock speed of the processor. PC Labs tests a range of local-bus products, from proprietary designs to those that conform to the VESA VL-Bus standard **137**

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Local-Bus: How to Get in Touch	139	Hopping on the VL-Bus	160
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Networking**Asynchronous Communications
Servers: Dialing In at Large**

BY FRANK J. DERFLER, JR., AND SUSAN G. THOMAS If you work on the road, at home, or at a branch site, you may fall out of the central LAN loop. Remote-client servers can keep you connected. This new breed of dial-in solution connects remote PCs as if they were actual nodes on the LAN, giving mobile and remote users transparent access to LAN-based applications and features **169**

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Graphics**Typesetting:
Choosing and Using Fonts**

BY EDWARD MENDELSON The introduction of TrueType into the PC market has left confusion in its wake. What does it mean for the casual user of type? *PC Magazine* guides you through the maze of competing font technologies and offers some practical advice for streamlining your font usage **199**

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Software**E-Mail Systems: Can They Keep
Their Customers Satisfied?**

BY RICK AYRE, ROBIN RASKIN, AND TED STEVENSON Give end users reliable messaging and they immediately demand more. *PC Magazine* rates seven electronic-mail systems with both DOS and Windows client front ends, analyzing ease of use, installation, maintenance, and security. Executive summaries outline the highlights and shortcomings of each system from the viewpoint of end users and administrators **261**

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Graphics**Business Illustration:
Art for the Masses**

BY GAYLE C. EHRENMAN Everyone wants to liven up dull business documents with some jazzy graphics, but not everyone has the patience, ability, or money to invest in professional illustration software. These five low-cost packages give even the least artistically inclined a way to bring beauty to those beastly documents **329**

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After Hours

From sequencing to computer-composed melodies, there's a music software package for you. In this roundup, we review four such packages: Twelve Tone Systems' Cakewalk Professional for Windows, Passport Designs' Encore for Windows, Soundtrek's The Jammer, and Howling Dog Systems' Power Chords519

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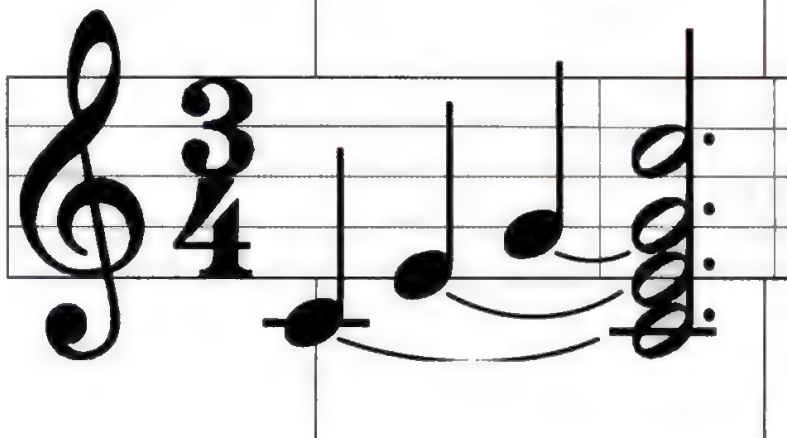
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Explore the standard MIDI file format using this tiny musical fragment (page 377).



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Except where noted: All *PC Magazine* reviews are of currently available products. Benchmark and performance tests are run on Compaq Deskpro 386/25s and 25e's.

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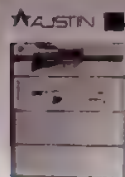
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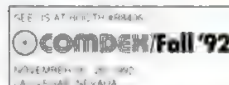
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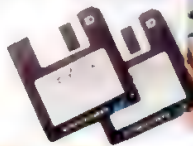
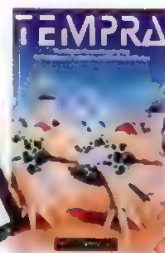
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Letters

PORTABLE PCs

There seems to be a tendency among computer makers to give people razors so they'll buy expensive blades, and *PC Magazine* is unwittingly cooperating. In your otherwise excellent cover story, "386 and 486 Notebooks: Fitting the World Inside Your Briefcase" (August 1992), you show which notebooks allow memory upgrades and even indicate whether the upgrades are user-installable. However, you don't say whether they allow the use of generic SIMMs or require more expensive proprietary memory modules.

Providing this information will help us make rational decisions on current products and encourage competition between computer manufacturers.

*Eric Schendel
Albany, California*

I was disappointed that in your evaluation of portable PCs you didn't compare systems with respect to "viewability." I was hoping that you could clarify and balance the hype about "twists," "shades," "lighting," "reflectiveness," "contrast," and "matrix activity."

*Robert W. North
Richmond, Virginia*

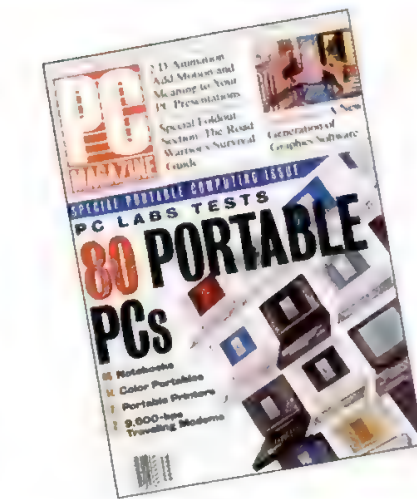
I'm curious about the total absence of Zeos machines from your recent portable roundup. I noticed Zeos has an ad for its Freestyle/SL computer embedded in the story. The ad caught my eye and I wanted to check out the stats, but there were none.

*Kent W. Smith
Allen, Texas*

• Zeos didn't ship that model in time to be tested for our August story. It will be included in our next notebook evaluation.—Ed.

EXCUSE ME, MR. SEYMOUR

Jim Seymour's column "The Uninstall Crunch" (August 1992) makes reference to the uninstall program in The Norton Desktop for Windows 2.0. Having written a good portion of the uninstall module for The Norton Desktop, I decided



*Portable PCs
are always a hot
topic of discussion.*

to write in and clarify something in the column.

While the Norton Desktop install program does create backups of the user's WIN.INI and SYSTEM.INI files when it is installed, these backups are not used to restore the user's files when the program is removed. Seymour seems to imply that the backups are just copied over the existing .INI files. If this were the case, the user would lose all changes to the .INI files made since The Norton Desktop was installed. This is precisely the reason it was decided not to have the uninstall program work this way.

The Norton Desktop uninstall program modifies the user's current .INI files to remove the lines that were put in during installation.

*Bruce Hellstrom
Van Nuys, California*

PC PALM READERS?

Jim Seymour's "New Interface Dilemmas" (July 1992) flows with ignorance. How is a computer supposed to know what tasks you have lined up ahead?

How would you account for all of the mind reading that would have to take place while the computer is deciding which commands are useful to the user at any given moment?

Who knows, Jim? There may be hope. I hear that when the 686 chip is released it will include a built-in ASP chip.

*Mike Wittmer
Houston, Texas*

LET'S STICK TO THE AGENDA

Lotus is about to sack Agenda, but I still need to use it every day. Other people who benefit from my files will have a tough time if they don't have access to the program.

These concerns are small when compared with what the PC community at large will lose when Agenda is gone. Anyone who can type needs this program to manage information. It's an incredible creativity tool, and its prowess in assisting thought is more impressive than what Lotus 1-2-3 has done for analyzing numbers. Agenda should have been a smash hit.

*David McDougall
Quebec, Canada*

HARD DISK DILEMMA

With program sizes eating up hard disk space, I have been considering purchasing a removable hard disk. I usually rely upon *PC Magazine*'s product reviews for information about the hardware and software I purchase. I would certainly appreciate an article comparing the various pros and cons of removable hard disks.

*Edward Queenan
Cranford, New Jersey*

TURN IN YOUR LICENSE

Apogee Software's new licensing agreement for shareware vendors establishes a \$250 license fee for a two-year period, followed by a \$150 fee for a perpetual license for its new program, Wolfenstein 3-D. Apogee is also releasing four new programs with separate licensing fees.

Has Apogee forgotten what shareware is all about? Only with the support of the shareware vendors can software authors get their programs distributed.

Establishment of this policy is irresponsible and could force many small shareware vendors out of business.

*Richard W. Bonin
Kernersville, North Carolina*

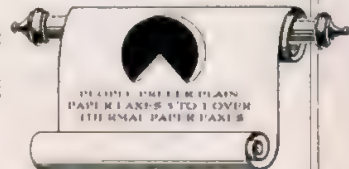
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LETTERS

ARE PIGTAILS IN FASHION THIS SEASON?

While PCMCIA devices are still in their infancy, I must comment on your somewhat skewed opinion of the modem module noted in "Make My Day: User-Friendly Laptop Features" (August 1992).

This somewhat cumbersome pigtail adapter for the RJ-11 interface contains a high-isolation transformer that protects the modem/notebook from telephone line surges. Having had personal experi-

*I find it notable that
the people who are praising
OS/2 the most have had
experience with the Amiga.
They have seen how
multitasking should
be done.*

ence with lightning strikes during a data transmission, I would rather have to replace a \$20 pigtail adapter than a \$3,000 notebook.

*R.J. Grasser
Rochester, New York*

WHAT'S IN A NAME

I was interested in your review of The Norton Desktop for DOS (First Looks, August 1992). I use this program and like it a lot. Its marketing, however, raises serious questions about Symantec's relations with loyal Norton customers.

Symantec has "orphaned" licensed users of Norton Commander by heralding Desktop as a new program rather than a Commander upgrade—despite the fact that file and disk management clearly are the core of both programs.

*Alan Cooper
Cincinnati, Ohio*

ON-LINE SERVICE

It was great to see your "Brief" (Trends, August 1992) concerning Chicago On-

line Service. I would, however, like to inform you that this is not a new or novel idea. The Fort Worth Star Telegram has been a pioneer in this type of local on-line service and just recently celebrated the tenth anniversary of its Startext Information Service.

Startext provides a service that is unique, and it has been on the cutting edge of a technology that is just now coming into its own—as evidenced by the advent of Chicago On-line and similar services that are available in St. Louis and Kansas City.

*Jim Boughton
Arlington, Texas*

THE IMPORTANCE OF BEING INFORMED

Too often I see computer consumers wandering into a store without really knowing what they are looking for, and then stumbling into some ignorant salesperson's arms. *PC Magazine* identifies the things that are most important to the consumer. You impartially evaluate systems, components, and software, and provide recommendations for each. It's nice that your magazine keeps us informed.

*T. Peter Chant
Port Coquitlam,
British Columbia,
Canada*

WHAT'S THAT AGAIN?

I had to re-read the first paragraph of John C. Dvorak's "My Wife Thinks I'm Nuts" (August 1992). Someone from *PC Magazine* embracing OS/2? Saying negative things about Windows? My goodness, what's next? A free 486 with your next subscription?

I find it notable that the people who are praising OS/2 the most are the people who have had experience with the Amiga. They have seen how multitasking should be done.

*Stuart Clark
London,
Ontario,
Canada*

I would like to respond to John C. Dvorak's recent column concerning OS/2. I'm impressed that it runs as fast as it does, and I prefer the whole environment over Windows.

If IBM can continue this past the

"honeymoon" stage, Uncle Bill better start looking over his shoulder.

*Richard Ashley
Novato, California*

GREAT FOR EVERYTHING

I was looking through the August issue of *PC Magazine* for about the third time when I came across the Letters section and all of the people ranting at you for the cross-platform review ("Platforms: How the PC Stacks Up," May 12, 1992). I thought it was a great review and I completely agree with you. Although Macs and workstations are great for some things, the PC is great for everything.

*Cameron Huang
New Canaan, Connecticut*

PC MAG ON TAPE

I have an hour-long commute to work, and I'm an avid reader of *PC Magazine*. Does it come in audio format on cassette?

*Michael J. Thomas
Oak Park, Illinois*

• Good idea. We aren't in audio format yet, but maybe if we can get William Shatner...Ed.

CORRECTIONS AND AMPLIFICATIONS

In the table of service and support options in *PC Magazine's* 1992 Service and Reliability survey (May 26, 1992), we reported that IBM did not offer on-site service. IBM has since informed us that service for IBM PCs is available through dealers or through the company's own on-site service facility, based in Montvale, NJ. In addition, toll-free technical support is available 24 hours a day, 7 days a week. Since the survey was done, IBM has added a 30-day money-back guarantee on PS/2s.

HOW TO WRITE TO PC MAGAZINE

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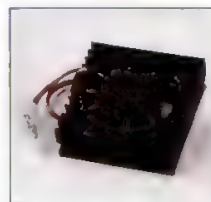
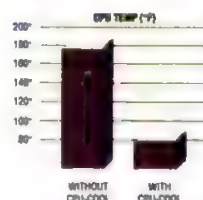


- **Way More Power.** With 50 amps of 12-volt power available for start-up, the TP900 easily runs up to 13 power-hungry drives. Perfect for the next generation of super network servers.
- **No Downtime, Ever.** Each TC450 has an MTBF of over 100,000 hours. In the unlikely event that one should fail, an alarm sounds, and the computer is sustained by the other TC450, while the user simply swaps in a new unit.
- **Allows Redundant UPSs.** Each of the TC450s can be connected to a separate UPS. Should one fail, backup power is retained from the other.

The TwinPower 900 comes in a monster case that holds two TC450 power supplies, the interface module, 6 fans, an 8-slot or 12-slot motherboard, and up to 13 drives. So, not only do you get the ultimate in power reliability, you also get the ultimate in system expandability!

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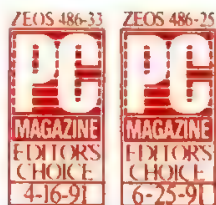


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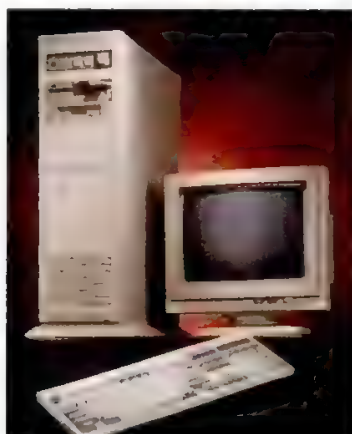
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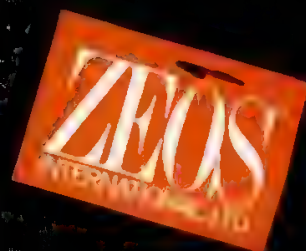
And, speaking of performance. In their *Editors' Choice* review, *PC Magazine* noted "ZEOS has a reputation for tweaking and refining that shows." That's the ZEOS way.

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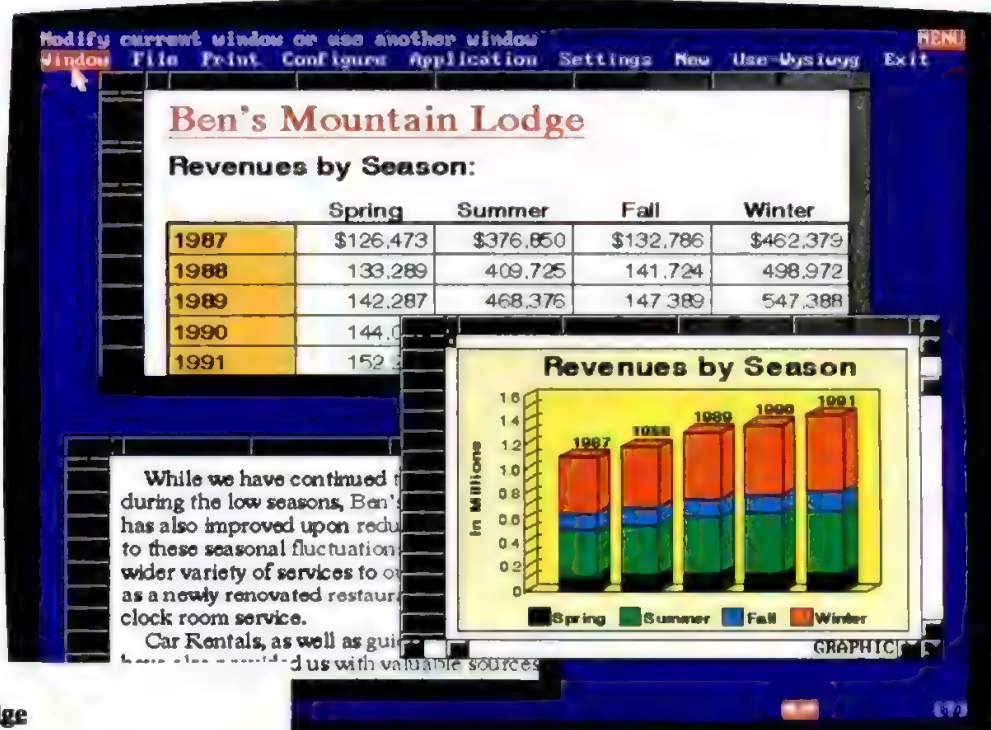
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Ben's Mountain Lodge

Revenues by Season:

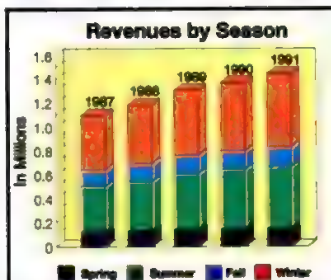
	Spring	Summer	Fall	Winter
1987	\$126,473	\$376,850	\$132,786	\$462,379
1988	133,289	409,725	141,724	498,972
1989	142,287	468,376	147,389	547,388
1990	144,090	498,042	151,234	575,878
1991	152,208	511,398	162,398	621,723
1992	153,947	532,684	184,010	630,242
TOTAL	\$852,294	\$2,797,075	\$899,541	\$3,336,580
AVERAGE	142,049	466,179	149,924	556,097

While we have continued to increase revenues during the low seasons, Ben's Mountain Lodge has also improved upon reducing its exposure to these seasonal fluctuations by offering a wider variety of services to our customers, such as a newly renovated gourmet restaurant and around the clock room service.

Car rentals, as well as guided tours of the mountains, have also provided us with valuable sources of revenue, making us much less dependent upon high season sources, such as skiing in the winter, and fishing and hiking during the summer months.

Our estimation is that these new sources of revenue

have increased our overall profitability by 24% over the past two years, and that other improvements to lodge facilities have attracted a wider variety of customers than we have seen in the past. Our expectation in the long-term is to see even more profitable years at Ben's Mountain Lodge.



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phonies, this one to be appreciated.

Introducing Symphony Release 3, now with a graphical WYSIWYG environment.

Symphony® from Lotus® has always been the one integrated DOS software package for all your business needs. But now this popular program, which features powerful spreadsheet, database, word processing, communications and graphics

environments, is really something to feast your eyes on.

For starters, it features a new WYSIWYG (What-you-see-is-what-you-get) interface, so you can easily create graphs, charts, diagrams, lines and arrows. An on-line tutorial and context-sensitive Help also make the program easier to work with.

With the new Symphony, you can switch environments on or off to maximize available memory to build even larger spreadsheets. Plus, you can use our improved file Viewer to quickly preview files before retrieving them. Or to link and combine files on your hard disk to your active worksheet. You'll also find our new Auditor helpful for analyzing and documenting complex worksheet logic.

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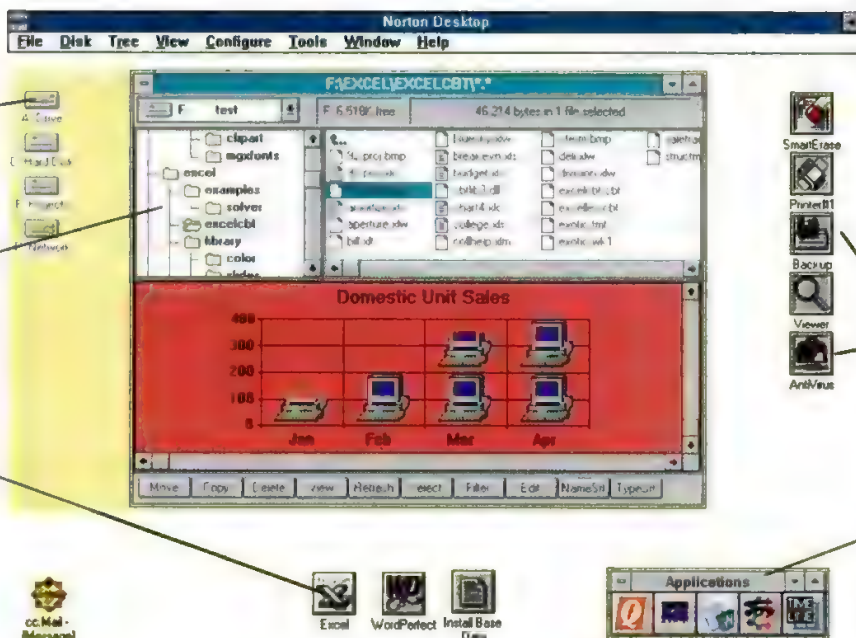
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NORTON DESKTOP FOR WINDOWS SAVES TIME, MONEY, ENERGY, AND DATA.

With Norton Desktop for Windows, your drive icons sit right on the desktop, so you get direct access to your files.

Click on a drive icon for easy file management. The drive window includes a tree pane, file pane, and a customizable button bar with a view option.

For total convenience, applications or files can be dragged onto the desktop for easy access. Open files effortlessly with a quick mouse click or, by dragging the file to the application.



The Norton Desktop is a completely integrated environment. You can drag-and-drop files from the drive window to a tool, drive icon, application, or onto the desktop itself.

All the utilities you need to backup, protect, and repair your data sit right on your desktop. You can drag files or drive icons directly to the tool you need.

Keep your favorite applications in a handy customizable toolbox. Launch the application easily with just a click of the mouse.

That's a package full of savings. Norton Desktop for Windows 2.0 enhances Windows in all the important ways. It helps you work faster, smarter, and with better results.

Saves Time.

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We all know time is money. And because Norton Desktop looks so much like Windows, you won't have to waste time learning how to use it. You get most everything you need to run your PC in one comprehensive package — a great, money-saving value.

"Norton Desktop for Windows 2.0 is still one of the best productivity tools you can buy."

— PC Computing, 5/92

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CIRCLE 344 ON READER SERVICE CARD

Multimedia Down to Earth

Microsoft, Tandy get more pragmatic.

When the MPC Marketing Council inaugurated the Multimedia PC in New York City last October, there was plenty of what President Bush calls the "vision thing." Led by Microsoft and Tandy, the Council dubbed it "the day computing changed." The group

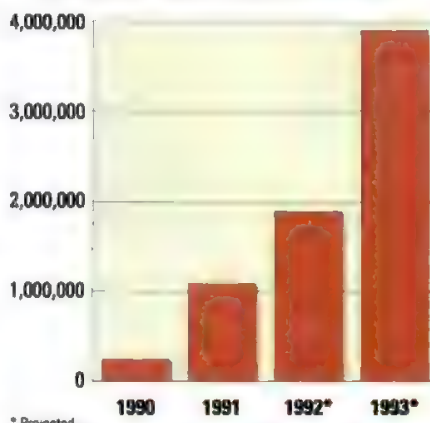
rented out the American Museum of Natural History and hired PBS technology historian James Burke to deliver the keynote address. In a unity fest as impressive as any political convention, 40 software companies and 30 hardware companies came together to support the new platform.

Nearly one year later, few companies would claim that multimedia has been a wild success. Even Glen Ochsenreiter, managing director of the MPC Marketing Council, acknowledges, "We expected things to be further along." But Council leaders Microsoft and Tandy are committed to multimedia for the long haul. As both companies start the second stage of their multimedia strategies, they are focused less on grand schemes for the world of tomorrow and more on pragmatic solutions.

"It's way too early to assess the success of multimedia," says Ed Juge, Tandy's senior director of marketing relations. Indeed, the MPC Council is still collecting data on the number of MPC machines sold. "Multimedia won't really take off until several hundred titles are available," says Juge. "And nobody expects that to happen until the end of 1993."

To solve the chicken-or-egg dilemma—how to sell hardware without software and vice versa—Tandy has bundled a wide variety of software into its latest MPC offering, the Sensation, introduced in August. The 486 MPC machine ships with Microsoft Works for Windows and Bookshelf, as well as communications software. It also comes with Tandy's own personal management

Sound Board Sales to Soar



Source: Multimedia Computing Corp., Santa Clara, California.

Microsoft hopes its new Windows Sound System will "jump-start the audio market in the workplace."

software. The most interesting part of the bundle may be Teleminster, a phone answering system with voice mail.

While Tandy concentrates on software, Microsoft is getting into hardware. The software giant will soon sell the Windows Sound System, a 16-bit add-in audio card that supports waveform and MIDI audio and will cost under \$300. Just as Microsoft brought out the Microsoft Mouse to spur the graphical user interface market, the company hopes its sound board will "jump-start the audio market in the workplace," explains Bob McBreen, product manager for Microsoft's hardware accessories group (the

Continues on page 32

DOS Apps Gain Type Choices

WHEN IT COMES TO SCALABLE fonts, Windows users are all set: Adobe Type Manager has been out for more than two years, and TrueType is built into Microsoft Windows 3.1. But what about DOS users?

Unlike Windows, DOS doesn't have a type scaler built in. You can add scalable fonts either by building them into the application (as Bitstream Speedo fonts are built into Lotus 1-2-3) or with WordPerfect add-on packages such as Bitstream's FaceLift (which uses Speedo fonts), LaserTools Corp.'s Fonts-on-the-Fly (which uses Agfa's Intellifonts), or LaserTools' new product, PrimeType for WordPerfect (which works with both DOS and Windows versions of the word processor). With PrimeType, WordPerfect users can use Type 1 fonts with non-PostScript printers for the first time.

TrueType add-ons for DOS products are due to arrive shortly. And the next version of Microsoft Word is expected to support TrueType. (For more on fonts, see "Type Casting: Choosing and Using Fonts" in this issue.)—Mary Kathleen Flynn

Pen Developers Point Fingers

WHO'S TO BLAME FOR DELAYS IN bringing pen computing to market? That depends on who you ask. Hardware makers, software developers, and the operating system creators—all struggling to invent this market—blame each other. Apps are finally beginning to trickle in, months after expected.

Applications developers give two major reasons for late shipments: hardware that won't meet users' demands and operating systems that aren't ready for prime time. "From a development standpoint we're ready," says Cathy Jones, director of sales at PenMagic, "but with the lack of hardware and final operating system versions, there's not been a lot of push to shrink-wrap the applications." The Vancouver-based company

Pipeline By Gus Venditto

ZDS Sells Direct to Users

After years of holding to the traditions that made Zenith Data Systems an early power in the PC business, the company is finally opening a direct sales division to sell and service PCs through an 800 number.

A steady stream of large PC manufacturers have made this change (ALR; Hyundai; Packard-Bell; and even IBM, to some extent). All are a bit late to a party started by Michael Dell that has been a path to success for more than a hundred small companies. One reason companies like Compaq, DEC, and ZDS resisted direct sales for so long is "channel conflict," a marketing problem. That's a polite way of describing the tempest that erupts when a retailer that has built its business by committing to a particular brand of PC hears its supplier talk about cutting it out of some sales. The retailer gets mad and talks about getting even. But because so many companies have already made the transition to direct sales, it's increasingly difficult for retailers to find suppliers without present or potential channel conflicts.

With so much competition in direct sales, you might think it's already too late for big companies to make the move. After all, ZDS's new strategy was announced within

days of bad news for some mail-order houses: Northgate was laying off people, and Zeos had suffered a quarterly loss. The reality is that selling PCs is a very tough business—so tough that some observers have been predicting an imminent shakeout, with some companies being forced to close. But even as some companies founder, new companies continue to open up 800 numbers. And a host of them—such as Insight, Sager, and Swan—are thriving.

These new companies can succeed because they're staying very close to their customers. They pay attention to customers' requests, keep an eye on their competitors' offerings, and stand ready to change their prices and product lines within days. With infrastructures that enforce high overhead and layers of bureaucracy, DEC, ZDS, and any other traditional players face a tough challenge in this environment. It's a classic contest between the swift entrepreneur and the large bureaucracy.

ZDS will probably stay in this business because it sees direct sales as a supplement to its other operations, a way to get a percentage of a burgeoning part of the PC market. Indeed, ZDS executives believe all PC makers will eventually take advantage of the full range of channels. But large companies must be careful to avoid struggling under the weight of a large infrastructure in a field that favors the nimble.

Gus Venditto is editor of *PC Sources* and a contributing editor to *PC Magazine*.



PHOTOGRAPH BY PETER CREMARE

released Numero, a pen-based financial package for the PenPoint environment, in mid-July, about a month after its scheduled ship date (206-988-9982).

Some applications developers, such as Pensoft Corp. and Slate Corp., had planned to develop software for GO Corp.'s initial PenPoint release but chose instead to wait for the software developers' kit for a later version. Slate delayed shipment of its two main PenPoint-based applications, At-Hand and Day-Timer Pen Scheduler, until the fourth quarter of 1992. But even the Windows version of Day-Timer Pen Scheduler began shipping at the end of July, three months later than expected (602-443-7322). And Pensoft's Perspective, a personal information manager for use under PenPoint, will ship three months later than originally

expected (415-802-6925).

Another product that won't appear until later in the year is PenCell for PenWindows, a spreadsheet from PenWare (408-249-7004). A PenWare spokesperson said the product is on schedule for the fourth quarter, but an announcement about availability will not be made until Fall Comdex.

Just as well, since the hardware is still evolving. Although a few pen-based machines are available—the Gridpad SL, the IBM ThinkPad, the NCR 3125 NotePad, and the NEC UltraLite SL/20P—the hardware has fallen short of many portable PC users' expectations. Battery life is too short, storage space is too limited, and reflective screens are too difficult to see.

"The hardware technology for applications that apply to the current PC user and

Pen Apps	
	AVAILABLE
Numero (PenPoint) PenMagic Inc.	Now
Day-Timer Pen Scheduler (Windows) Slate Corp.	Now
Perspective (PenPoint) Pensoft Corp.	Late September
At-Hand (PenPoint) Slate Corp.	Fourth quarter
Day-Timer Pen Scheduler (PenPoint) Slate Corp.	Fourth quarter
PenCell for PenWindows PenWare Inc.	Fourth quarter

the general consumer isn't really there yet," says Maurice Voce, Slate's director of marketing communications. "I expect that a host of new products will come out in early 1993, but the PDA-type products really won't be available until late 1993 or early 1994."

—Julie Cohen

Optical Drives Get Faster

TECHNOLOGY'S SPIN DOCTORS will be turning out faster and higher-capacity rewritable magneto-optical (MO) drives in the next six months.

The first wave of MO drives were hamstrung by slow 2,400-rpm spin rates and bulky head mechanisms. A single removable CD-like MO disk can store 595MB of information (298MB per side for \$160 per disk), but with an average access time of 70 milliseconds—versus the sub-20-ms times of hard disks—these 5.25-inch MO drives were relegated to archival storage uses.

That's beginning to change. The first of the next-generation MO drives on the market is the \$4,195 Pinnacle Micro PMO-650 (First Looks, September 29, 1992). The mass of the PMO-650's drive head is reduced by using a split optics design that puts most of the heavy laser optics onto a fixed part of the drive. Together with a 3,600-rpm spin rate, this has brought the average access time of the MO drive down to 45.9 ms. More important, by combining data caching and queuing approaches, the Pinnacle drive can actually match the speed of standard hard disks in real-world applications.

Sony plans not only to increase the speed of MO drives but to raise the storage capacity as well. The company is currently working on a draft for a new enhanced-capacity standard for MO drives that will store 1.3GB

of data on a 5.25-inch disk. The increased capacity relies on a technique borrowed from hard disks called *zone CAV* (constant angular velocity), which allows data to be stored at the same density on the inside and outside tracks of an optical disk. Anticipated for introduction early next year, Sony's 1.3GB drive will employ split optics, a spin rate of 3,000 to 3,600 rpm, and a large data buffer.

More MO gains may be close behind. Sony's much-ballyhooed recordable audio mini disk system uses a 2.5-inch MO disk in a single-pass system. (Current MO drives make at least two passes to write data to disks.) This design, dubbed *direct overwrite*, could theoretically be used in MO drives for PCs, bringing average access times within a couple of milliseconds of hard disk performance.—*John R. Quain*

When Worlds Converge

CONVERGENCE MAY SOUND LIKE some far-out fantasy from a sci-fi flick, but some very serious PC executives are using the term to describe the inevitable merging of personal computers and consumer electronics, education, and entertainment.

Most people in the PC industry agree that within three to five years, a high-bandwidth pipeline (ISDN, fiber-optic, satellite—who knows?) will bring huge databases of multiple data types (audio, video—you name it) into businesses and homes, and that

people will interact with these databases in ways we're just beginning to imagine. While the world waits for telephone, cable TV, and broadcast satellite companies to fight each other for the rights to this mega-pipeline, some little-known startups—with some very well-known founders—are already developing a new breed of interactive applications.

Microsoft CEO Bill Gates launched Interactive Home Systems (IHS) in 1989, one year before he outlined his vision of Information at Your Fingertips. Exactly what products IHS will sell is still vague, but the company has been hard at work buying up the electronic rights to images for its digital visual library. IHS has already signed up the National Gallery of London and expects to make more announcements shortly (206-861-4533).

"We're interested in much more than just visually oriented databases," says IHS president Steve Arnold. "We're talking about giving people a new set of meaningful choices. And I don't mean just letting the viewer pick a different ending to a story. I mean providing a personal data stream that's navigable."

Imagine, for instance, watching *Lawrence of Arabia* and being able to call up the latest biography of T.E. Lawrence, or a multimedia map of Arabia. "This integrated information will mean different kinds of filters and a whole new way of programming," says Arnold. "You're going to tell your story in a different way if you know viewers

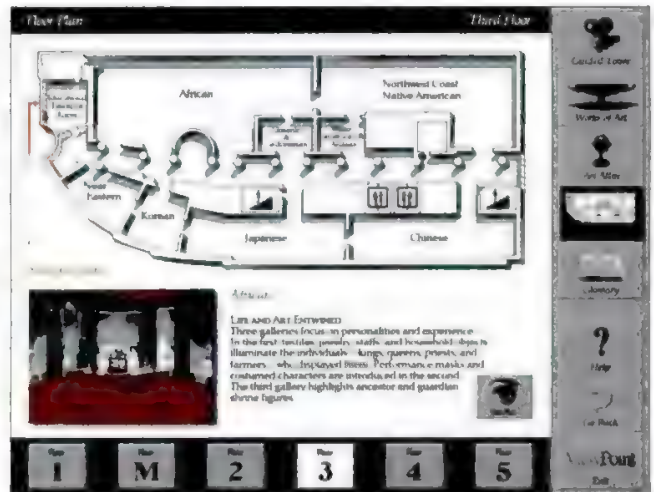
will have different reactions to it and different interactions with it."

This fall, Axxis Software, founded by Paul Grayson (CEO of Micrografx) and Steven Buerkle, is delivering products that allow increased interaction without a high-bandwidth pipeline. The Zagat-Axxis CityGuides will locate addresses, figure out the best routes for you to take, and even recommend restaurants (800-394-3549). In the future, products like these could be improved by on-line time-sensitive information, such as traffic conditions.

Movie buffs and travelers won't be the only ones to benefit from the new world order. Businesses will be the first audience targeted by Star Wave, a company launched this summer by Paul Allen, who cofounded

Top Retail Software		
Current ranking	Last issue	Product/Company
1	3	WordPerfect 5.1 for DOS WordPerfect Corp.
2	7	QEMM-386 6.0 Quarterdeck Office Systems
3	4	Microsoft Windows 3.1 Microsoft Corp.
4	10	Office for Windows 2.5 Microsoft Corp.
5	5	Microsoft DOS 5.0 Upgrade Microsoft Corp.
6	6	Procomm Plus 2.1 DataStorm Technologies
7	1	Microsoft Windows 3.1 Upgrade Microsoft Corp.
8	11	WordPerfect 5.1 for Windows WordPerfect Corp.
9	8	Stacker 2.0 Software Only Stac Electronics
10	14	Word for Windows 2.0 Microsoft Corp.
11	9	Word for Windows 2.0 Upgrade Microsoft Corp.
12	—	Instant Recall 2.0 Chronologic Corp.
13	12	Lotus 1-2-3 2.4 Lotus Development Corp.
14	—	386 MAX 6.0 Qualitas Inc.
15	2	Procomm Plus for Windows DataStorm Technologies

The list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending August 15, 1992. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market. Sales information compiled by Ingram-Micro.



IHS's ViewPoint installation provides a tour of the Seattle Art Museum's African and Northwest Coast Native American collections.

Microsoft and Interval Research and founded Asymetrix.

"We're interested in providing business information services," says Star Wave president Steve Wood. Examples of the types of on-line data that businesses need are market research, news headlines, and stock quotes, says Wood, who cites services like Lexis and Nexis. "Where we can add value is in ease of use, in better ways to organize and search data, and in expanded data types," he says. Star Wave expects to deliver products within one or two years (206-957-2000).

In the meantime, hardware vendors are already poising themselves for the new applications. Tandy's new Video Information System, a CD player that lets home users run Multimedia PC apps without a computer, has "provisions for adding interfaces to things that could happen in the future," says Tandy's senior director of marketing relations, Ed Juge. According to Juge, the high-bandwidth pipeline "is not an if, it's a when."—*Mary Kathleen Flynn*

Catching Criminals

STARTING A CRIMINAL INVESTIGATION quickly can make the difference between losing the trail and making the arrest. Emerging PC-based applications promise to help law enforcement agencies reduce ramp-up time for investigations significantly.

Identicator Corp. (415-873-8650), which makes a child identification kit called Kid Print, is developing systems that transmit fingerprints, mug shots, and documents. Fingerprint transmission is nothing new, but PC technology enables the transmission of highly detailed, more identifiable prints. Fingerprints can be captured and identified "live" or stored and examined later; latent prints can be transmitted to another computer and enhanced for better identification.

The FBI is developing a PC-based Integrated Automated Fingerprint Identifica-

tion System, due on-line in 1996, which will transmit fingerprint information electronically. This involves creating an entire data network, since a ten-fingerprint set makes a 10MB data file, and the 30,000 to 100,000 sets received by the FBI each day would overwhelm the phone system. The system will use proprietary software from Hayes (and a new algorithm that allows 20:1 compression) to move



Identicator's Direct Fingerprint Reader.

print information between 62,000 law-enforcement agencies and the FBI over dial-up and leased lines.

The FBI's National Crime Information Center is also working on a system for transmitting fingerprints and mug shots directly from patrol cars. This system will go on-line in late 1993; as many as 500,000 squad cars will even-

tually carry the portable 386s that make it possible.

IBM's Special Programs Division (415-694-3000) is working with the National Center for Missing and Exploited Children on the "Have You Seen Me?" network. At

present, the Center sends information electronically to 43 state clearinghouses, which reach over 400 assistance agencies. IBM is making its multimedia Audio Visual Connection-based application available as part of the planned electronic network.

The IBM package transmits text, audio, and visual information. This cuts down on the time it takes to mount a search. Preparing and designing a missing-child poster previously took up to a month; with the PC-based system for applying information and digitized photos to a template, the same poster can reach police, child-finding agencies, and the media within hours. Additionally, IBM has codeveloped applications that allow "age enhancement" of photos for children who have been missing for a long time. Eventually, the Center hopes to install the application on kiosks in public places such as airports, malls, and truck stops.

—Angela Gunn

Multimedia

CONTINUED FROM PAGE 29

Mouse folks). Claire Merriam, director of marketing communications at Media Vision (maker of the Pro AudioSpectrum sound boards), points out quite diplomatically that "Microsoft will lend credibility to the fact that there's a use for multimedia in business."

The Windows Sound System lacks some features entertainment customers may want, such as a joystick port and a MIDI port, but it comes with some software that should please business customers. You can annotate files with voice-mail messages; you can listen to your spreadsheet data read back to you, and you can move around in Windows by speaking (yes, speaking!) instead of pointing and clicking.

One multimedia capability that's still missing for business and entertainment customers alike is affordable high-quality full-motion video. Although Microsoft has not introduced any products yet, the company is working on video. In March, Microsoft teamed up with Intel to announce the Digital Video Media Control Interface (DV MCI), a video command set that lets Windows apps take advantage of digital video devices, such as Intel's high-end ActionMedia 2 Delivery Board. And Microsoft has been giving technology demonstrations of video under Windows, with both software-only and hardware-assisted implementations. Although the demos have improved, they still don't look as good as TV. Expect to see some announcements from Microsoft this fall.—Mary Kathleen Flynn

Briefs

WHILE OFTEN LATE, SOFTWARE HARDLY ever ships early. But Windows for Workgroups is expected to show up several months ahead of schedule. Originally due in early 1993, Microsoft now says the product (which adds file and print sharing, mail, and scheduling to Windows) will be available this fall.

TANDY'S NEW VIDEO INFORMATION

system lets home users run Multimedia PC software without having to buy a computer. But although it will play your CD-Audio disks, it can't handle regular CD-ROM disks. They have to be specially encoded to run on the player. And MPC programs have to be modified to work with the machine's wireless hand controller and with Modular Windows, the version of Windows 3.1 built into the VIS player. But, say Microsoft and Tandy, the conversion process is trivial. And

developers seem to agree: Nearly 50 companies have announced support for the new platform.

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help you prevent repetitive stress injuries such as carpal tunnel syndrome, you may want to try H.W.E.'s \$70 pear-shaped "oscillator." Every 30, 60, 90 or 120 minutes, the PEAR beeps to remind you to stop working and start its 3,500-5,000 rpm motor (800-742-5493).

"IF ROASTED QUAYLE IS YOUR GAME,"

you'll probably enjoy Quayle Quotes, a \$6 Windows program that displays verbal gaffs the vice president has made as well as jokes he has inspired (Kimerlin Software, P.O. Box 3078, Santa Clara, California). As the opening screen says, "We have read Dan Quayle's lips and he has some pretty funny things to say!"

—Mary Kathleen Flynn

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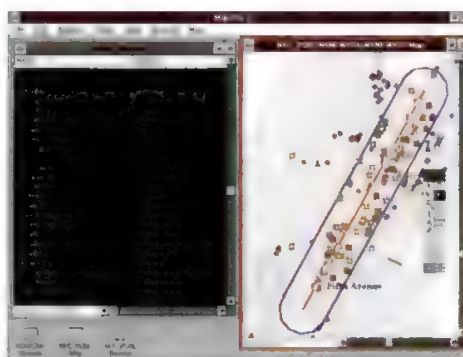
MapInfo for Windows Brings Your Business Down to Earth

BY ROCK MILLER

MapInfo for Windows (\$995) has always done a superb job of applying the often arcane abilities of a geographic information system (GIS) to business tasks. It's a powerful tool for any job that involves demographic analysis, from the planning of marketing and direct-mail campaigns to the evaluation of sales territories. In Version 2.0, enhancements in the geographic database query, map projection, geocoding (the attachment of geographical location information to data records so that they can be placed on a map), and presentation layout round out the capabilities of this increas-

ingly rich and mature software product.

In addition to offering MapInfo's previous radius search function, Version 2.0 lets you select objects within a given "buffer" area around any number of points, lines, or regions. Using this feature is exceptionally straightforward; you simply select the objects, and MapInfo generates a polygon of the appropriate shape around them. You can reshape the buffer region and reset its at-



CUSTOM MAPS: MapInfo's geographic query.

tributes just as you would manipulate any other polygon, and you can use the polygon-select tool to select the records whose locations fall within the buffer region.

UNIQUE GEOGRAPHICAL QUERY

MapInfo's well-designed multi-windowed interface helps you analyze data in several ways. In addition to creating maps from database information, you can also view the databases themselves in tabular form, and you can even make simple graphs of numeric data. Its innovative file system lets you work directly with files in .DBF, .WK1, or .XLS format. A supplementary table file keeps track of geographic and other MapInfo-specific information.

Version 2.0 enhances the program's robust relational data-handling functions with some powerful GIS capabilities. The program's method of selecting regions that are within, intersect with, or are adjacent to other regions is implemented in an unusual and innovative way: as geographic operators within the program's powerful structured query language (SQL). Though this means you must be comfortable with SQL queries, code jockeys will find this design offers a powerful shorthand way to combine both geographical and data-based selection in a single operation.

Geographic operators are especially useful in conjunction

• *Continues on page 40*

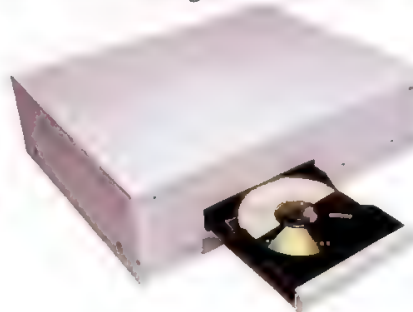
■ CD-ROM

Philips CDD 521: CD-ROM Recording Comes to the PC

BY JOHN R. QUAIN

Looking more like a piece of home stereo equipment than a computer peripheral, the Philips CDD 521 Compact Disc Recorder is the first economically viable CD-ROM recorder for small-business users. Its list price of \$7,995 includes software, one blank disk, and a SCSI adapter; this undercuts the price of the first generation of recorders, such as those from Sony and Yamaha, which only a year ago cost \$20,000 or more.

of the CDD 521 is its reasonable price and painless operation. It is ideal for businesses that must have the ability to make a couple of CD-ROM disks quickly without resorting to a rack full of



RECORDING STUDIO: The Philips CDD 521.

equipment or to expensive service providers.

Using a standard CD drawer rather than a finger-pinching CD-ROM caddy, the CDD 521 accepts 5-inch and 3-inch disks and will play and record CD-ROM disks. Approximately 600MB of data can be stored on a 5-inch disk and about 200MB on a 3-inch disk. A blank disk is only \$40. Unlike competing magneto-optical drives, however, the CDD 521 is not a true rewritable optical storage device. The disks can only be written to once, though information can be added to partially recorded disks.

The CDD 521 conforms to the current Orange Book for recordable CD devices and can potentially

• *Continues on page 42*

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The primary advantage

PCs

Three 66-MHz 486DX2s Address Different Needs, Markets—But All with Speed

BY MATTHEW J. ROSS

Thanks to the compatibility and smooth integration of Intel's new speed-doubled 66-MHz 486DX2 line of processors with existing 33-MHz motherboard designs, PC buyers were overwhelmed with available systems soon after Intel's August rollout (see "First 66-MHz DX2 Systems Show Their Blazing Speed," First Looks, October 13, 1992). This latest group of 66-MHz systems, from AST Research, Compaq, and Tri-Star, differs dramatically in price, appearance, and configured options, but all three share that fast processor and the performance benefits it brings.

At the heart of each of these systems is Intel's second version of its "speed-doubled" DX2 processor, running at 66 MHz. Like its 50-MHz DX2 sibling, the 66-MHz part performs all internal operations at twice the speed of the local bus components, enabling PC manufacturers to turn out systems that offer about a 20 percent performance boost over 50-MHz 486DX and DX2 PCs. And like existing Intel 486s, the 66-MHz DX2 contains the same internal 8K memory cache, integrated math coprocessor, and 32-bit 486 processor core logic.

AST BRAVO 4/66

Carrying the lowest price tag of the three systems, the \$3,045

AST Bravo 4/66 is slowest on performance and has the shortest list of standard features. The small-footprint AT-bus unit is considerably underpowered (4MB of RAM, 120MB hard disk) compared with the \$5,698 Compaq Deskpro 66M and the \$8,195 Tri-CAD Ultra 486



COST CONSCIOUS: The AST Bravo 4/66.

EISA/66, but the Bravo remains a solid performer intended for cost-conscious corporate desktops.

The Bravo line is the lower-priced of AST's two PC lines, and systems in it offer four open ISA expansion slots accommodating full-length cards in its small-footprint design. Video circuitry (Cirrus Logic's 5422 VGA controller) is integrated onto the motherboard to reduce costs. The resulting video is competent, but cannot compare with the accelerated and coprocessed video in the Compaq and Tri-Star systems. AST's video performance under Windows suffered. It fared better on the hard disk test thanks to a fast 120MB IDE hard disk—the Quantum ProDrive LPS.

In another effort to build the most cost-effective PC, AST uses the same four-layer motherboard found throughout the Bravo line. The DX2/66 chip resides on a small daughtercard that holds the CPU with its required heat sink, a four-way set-associative cache with 256K of fast SRAM, and a VLSI chip set.

Twelve wire traces show that the design was being modified late in the manufacturing process, and processor and memory performance lagged slightly behind the Compaq Deskpro 66M. AST's motherboard has four SIMM banks that accept up to 64MB of memory, but it has no provision for a Weitek math chip or Intel's OverDrive socket for future upgrades—further cost-saving moves.

A convenient feature is AST's removable disk drive subassembly. You simply remove three screws and it lifts right out, ready for servicing. AST is going after corporate sales with this rugged and dependable (if not flashy) desktop. It's well-constructed and offers two internal drive bays, two front-accessible bays, a competent 14-inch monitor with a tilt/swivel base and digitally-controlled brightness and contrast on the front panel.

• List price: AST Bravo 4/66, with 4MB RAM, 120MB IDE hard disk, 1.44MB floppy disk drive, 14-inch Super VGA monitor, DOS 5.0, Windows 3.1, and mouse, \$3,045. AST Research

Inc., 16215 Alton Pkwy., Irvine, CA 92718; 800-876-4278, 714-727-4141; fax, 714-727-9355. Circle 428 on reader service card

COMPAQ DESKPRO 66M

With 8MB of RAM, a 210MB IDE hard disk, and Compaq's stellar QVision video combined with a 17-inch flat panel display, the Compaq Deskpro 66M (Model 210 Windows Edition) will be the envy of most Windows users. Combining Compaq's modular EISA small-footprint PC with beautiful (and fast) video and new Business Audio may be enough to make serious corporate Windows users look past the \$5,698 list price.

Taking its place at the top of Compaq's single-user small-footprint desktop line, the Deskpro 66M doesn't disappoint. Its case design, construction, and quality finish are the same as those found in the rest of the Deskpro M family. Compaq's one-third height, 3.5-inch floppy disk drive allows for three front-accessible drive bays in the least amount of space for users who need CD-ROM or tape backup drives.

Inside, the Deskpro 66M offers a modular design. It holds Intel's latest processor along



TOP PERFORMER: The Compaq Deskpro 66M.

with a heat sink, a two-way set-associative write-back cache with 256K of cache memory, and room for a Weitek math coprocessor all on a proprietary daughtercard. There's also

First Looks

room for a memory card (which offers expansion to 64MB) and five EISA expansion cards.

Compaq's modular design does nothing to compromise performance, though, as the Deskpro 66M outpaces both the AST and Tri-Star in processor and memory performance. Add in Compaq's incredibly fast QVision 1024E EISA accelerated video controller (with its high score of just under 20 million on PC Magazine Labs' Graphics Winmark test), along with its 17-inch QVision 170 flat panel monitor (featuring digital controls on the front panel and good color), and Compaq has a performance winner. The only disappointment in the Deskpro 66M is its 210MB IDE hard disk.

The Compaq also adds customer convenience to its fine quality and performance. Its included Business Audio—a small microphone; an internal speaker; an external audio adapter featuring connectors for line out, headphone out, and left and right channel line in; and the necessary software—adds voice annotation functionality under Windows 3.1.

The Deskpro 66M also includes a PS/2-style mouse, which is ergonomically shaped, like a Microsoft mouse. It's part of a Windows 3.1 bundle that includes an impressive 20MB animated product overview of the Deskpro 66M, a Business Audio tutorial, and Compaq's EZ Help

Online Library. The help was buggy but contained good information on DOS commands.

• List price: *Compaq Deskpro 66M Model 210 Windows Edition, with 8MB RAM, 210MB IDE hard disk, 1.44MB floppy disk drive, QVision 1024E video controller, Business Audio, mouse, DOS 5.0, and Windows 3.1, \$4,399; 17-inch QVision 170 Super VGA monitor, \$1,299. Compaq Computer Corp., P.O. Box 69-2000, Houston, TX 77269; 800-345-1518, 713-370-0670.*

Circle 429 on reader service card

TRI-CAD ULTRA 486 EISA/66

Tri-Star has made a business of selling high-end graphic workstations to the AutoCAD market, and its Tri-CAD Ultra 486 EISA/66 is no exception. This \$8,195 tower system came equipped with just about every possible accessory designers could possibly want, including a 21-inch IDEK flat panel monitor, a coprocessed NDI Volante AT2012 video adapter, a 660MB SCSI hard disk from Maxtor coupled with a 4MB cached DTC 3290 caching controller, Calcomp's DigiTab-II drawing tablet, a Zoom internal fax modem, and a D-Link 10-BaseT Ethernet adapter.

The Tri-CAD Ultra 486 EISA/66's standard tower chassis is better suited to one user

than as a network file server. What makes it less desirable as a server is its stylish tower case, which is quite sturdy but not easy to remove. To get inside you must remove the entire case, not just one side panel.

Once open, the Tri-CAD Ultra has a clean appearance. There's plenty of room to navi-



HIGH-END GRAPHICS: The Tri-CAD Ultra 486.

gate, and no components are blocked. Four of seven drive bays are front-panel accessible, and one of the internal drive bays can accept a full-height 5.25-inch disk drive. An ample 220-watt power supply fuels the EISA motherboard, which contains eight full-length slots powered by the 66-MHz chip and an Opti EISA chip set. Memory consists of 16MB of 70-ns DRAM and 256K of 20-ns SRAM expandable to 64MB in four SIMM banks.

Processor and memory performance were unexceptional compared with that of the Compaq Deskpro 66M. More annoying was an intermittent problem: the Tri-CAD Ultra couldn't be rebooted from the keyboard successfully, although a reset button worked fine (Tri-Star engineers are looking at the problem). The rest of the Tri-Star system was filled with high-quality stock component parts. The Maxtor SCSI hard disk-DTC caching-disk-controller combination obliterated the competition.

The video controller, an NDI Volante AT2012 based on the Texas Instruments 34020 processor, had a fast Graphics Winmark

score of almost 14.3 million. To keep all these components running smoothly, Tri-Star throws in a Zoom fax modem and a complimentary membership to the company's BBS, which focuses on AutoCAD. With its quality components and dedication to the CAD and high-end computer graphics market, Tri-Star has put together a winning system for that specialized audience.

• List price: *Tri-CAD Ultra 486 EISA/66, with 16MB RAM, 660MB SCSI hard disk, 4MB DTC 3290 caching SCSI disk controller, 1.2MB and 1.44MB floppy disk drives, NDI Volante AT 2012 coprocessed graphics controller, 21-inch IDEK Super VGA monitor, D-Link 10BaseT Ethernet adapter, internal Zoom fax modem, Calcomp DigiTab-II drawing tablet, Tri-CAD Interactive Computer-based Training for AutoCAD, WinFax software, free membership to Tri-Star's bulletin board (focusing on AutoCAD), \$8,195. Tri-Star Computer Corp., 120 S. Weber Dr., Chandler, AZ 85226; 800-755-1000, 602-961-3401; fax, 602-961-4010.*

Circle 430 on reader service card

Benchmark Tests: 66-MHz Systems

Like the first three 66-MHz systems that PC Labs tested, this group easily outperformed 50-MHz 486DX systems on our processor tests. Compaq's QVision video system boosted the Deskpro 66M's video performance beyond that of any other 66-MHz system we've tested, and the Tri-Star's high-end SCSI hard disk was a fast performer.

We used PC Magazine Labs' Hardware Performance Tests, Release 6.0, to measure each PC's processor, memory, disk, and video subsystem performance. The Graphics Winmark is the geometric mean of 12 Windows-based graphics tests from WINBENCH 2.5, weighted to reflect how frequently various functions are used

Higher scores represent better performance.	Processor (operations per second)	Memory (kilobytes per second)	Disk (kilobytes per second)	Video (thousands of operations per second)	Graphics Winmark (megapixels per second)
Compaq Deskpro 66M (486DX2/66)	698	10,312	111	6,041	19.88
AST Bravo 4/66 (486DX2/66)	667	8,047	208	4,389	3.73
Tri-Star Tri-CAD Ultra 486 EISA/66 (486DX2/66)	667	7,865	685	2,020	14.27
486DX/50 average	514	8,017	352	2,605	6.09
486DX/50 average	487	6,430	276	2,539	5.51

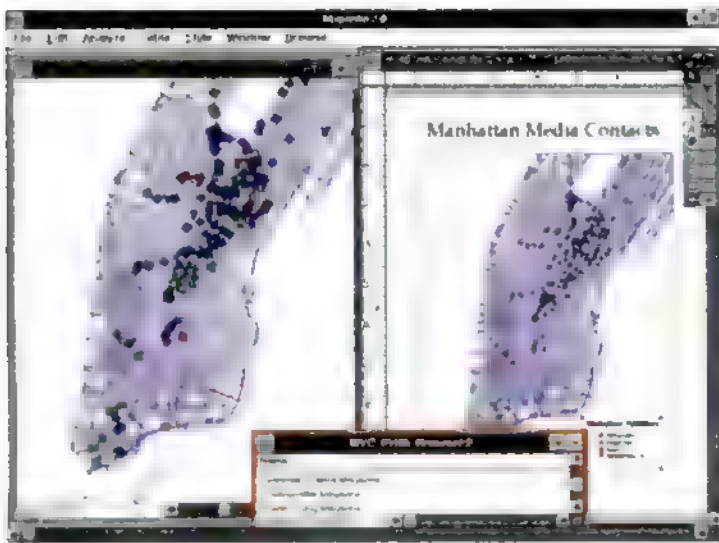
First Looks

MapInfo

CONTINUED FROM PAGE 37

with the powerful MapBasic development language, which developers can use to create custom mapping-based information systems. The package comes with several small MapBasic applications to create scales and convert symbols, and you can purchase the full development kit—MapBasic Development Environment—for \$795.

Though MapInfo's database capabilities are powerful, the mechanics of querying could stand some refinement. The Select and SQL Select functions use slightly different syntax for identical queries, while appends and joins are handled separately from either. Although you can use buttons and lists to build SQL queries by pasting table names, column names, and functions into the query window, the program gives you no help in puzzling out the syntax other than telling you whether you're wrong. This poses problems with the geographic functions, which are quite counter-intuitive. The syntax error checker



PAGE LAYOUT: MapInfo has great graphics.

does not pinpoint the location of your errors, and the help system is nonstandard, badly designed, and not context-sensitive.

IMPROVED GEOCODING

MapInfo's clear and easy-to-use geocoding function (which operates on selected records as well as entire files) is one of its major advantages. Version 2.0 gives you finer control over the process. You can now specify an additional boundary file to re-

FACT FILE

MapInfo for Windows, Version 2.0

MapInfo Corp., 200 Broadway, Troy, NY 12180; 800-327-8627; 518-274-6000; fax, 518-274-0510

List price: MapInfo for Windows, \$995; MapBasic Development Environment, \$795; upgrade, \$250.

Requires: 4MB RAM, 6MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.0 or later, mouse.

In short: A steady advance on a solid foundation, MapInfo 2.0 continues to improve at the task of applying powerful GIS technology to business problems, with improvements in data selection, geocoding, and presentation.

426 ON READER SERVICE CARD

fine the search (this is most useful when address-matching in large metropolitan areas, where the same address may occur in different neighborhoods or cities), and you can display an additional column (the city name, for instance) to help you pinpoint ambiguous addresses. There's also help for those hard-to-match addresses: Records that fail to geocode can have "result codes" attached to a separate column in the database, letting you select and bulk-correct such records. Unfortunately, geocoding is still slow; it took half an hour to make a first pass through our 7,144-record test database.

IMPRESSIVE MAPMAKING

Version 2.0 is equally impressive for its newfound presentation capabilities. Its flexible WYSIWYG layout window lets you place any number of map views, legends, scales, data tables, and other text and graphics elements freely on a page; there is no limit (other than printing complexity) on the number of insets you can

use on a single map. Each map frame is fully live and updates itself as you change the data or zoom level of the source map.

Another plus: You can switch to any of many dozens of map projections on the fly, without a lengthy export process; with a math coprocessor or a 486, the conversion takes place rapidly. You can export presentation-quality maps in .WMF format, or snap a view to the Clipboard in .BMP format.

In the thematic mapping arena, MapInfo is capable of scaling symbols proportionately as well as letting you select them by type. Its ability to do basic summaries (record counts, sums, averages, and so forth) on records is another plus. You can apply thematic shading or symbols to any layer, so the number of variables on a map is limited only by your ability to understand them. You can't do bivariate themes (for instance, symbols that vary by both size and type) on a single layer, however.

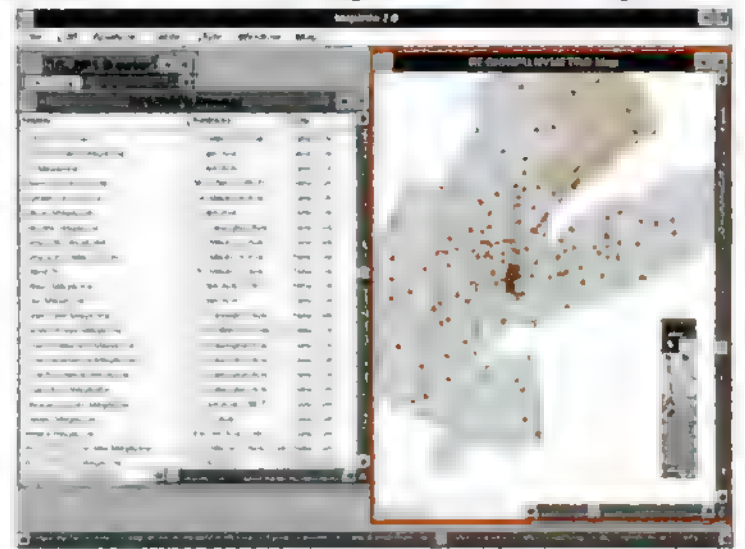
The program unaccountably fails to support shading by standard deviations (although the manual documents how to generate the ranges), and you can't cut and paste the summary statistics the program generates.

Text and label handling has been much improved by means of TrueType and other font manager support. You also have a much larger selection of line and fill patterns to choose from, though color palette handling is still awkward. Labels (which you can apply automatically or individually, using any data field or expression) as well as symbols and

other annotations are located on a separate "cosmetic layer."

PERFORMANCE TUNE-UP

In terms of performance, MapInfo could use a thorough tuning. Though its basic redraw performance seems adequate, it could cut down on the number of unnecessary total redraws, as well as incomplete redraws that force you to spend the time to redraw each window manually. Printing can also be glacial,



PERFECT PLOT: Database and mapping in one.

though the resulting PostScript files are not overly large.

Finally, the program could offer a better selection of basic map files: The included data is limited to state boundaries with basic population and income data, plus ZIP code centroids

and a few sample street and world maps. Such basics as county boundaries (which are unacceptably crude) and highways must be purchased separately. Fortunately, the ZIP code boundaries are of high quality, and you can also import and export geography directly in .DXF format, as well as digitizing paper maps.

MapInfo for Windows is now a stable product, free of the annoying instability and bugs of the first release we tested. If the data you work with incorporates a geographical or locational component, MapInfo can help you make sense of it all. □



To download a working demo of MapInfo from PC MagNet, type GO ZNT:DEMOS from any CompuServe prompt. From October 12 through 16, you can go on-line to discuss MapInfo with Rock Miller and MapInfo Corp. cofounders Laszlo Bardos and John Haller. Type GO ZNT:EXEC.



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CD-ROM

CONTINUED FROM PAGE 37

be used to record other CD formats, including CD audio (Red Book), CD-ROM XA (Extended Architecture), CD-I (Interactive, Green Book), and Kodak's Photo CD format. In the configuration we tested, the CDD 521 is limited to CD-ROM use only. Unlike standard CD-ROM players, it cannot play back audio compact disks, and the other CD formats cannot be recorded without additional hardware and software. Several third parties offer such systems with the CDD 521, including OptImage for CD-I (800-234-5484) and Optical Media International for CD audio (800-347-2664). Prices for such packages range from about \$16,000 to \$20,000.

Connecting the CDD 521 to a PC is no more complicated than hooking up a peripheral. It comes with a SCSI-2 Adaptec AHA 1242 adapter card that fits in a 16-bit ISA slot and connects to the CDD 521. Installing the CDwrite software is a matter of creating two directories, copying the software to your hard disk, and inserting software driver statements in your CONFIG.SYS and AUTOEXEC.BAT files.

TWO DRAWBACKS

The CDD 521 behaves like a conventional CD-ROM drive. Consequently, it lacks the DOS habits expected of, say, hard disks. You cannot write to a disk by using DOS's XCOPY or COPY commands, for example, or rename a file once it has been written to the CD.

For making CD-ROM disks in DOS, Philips Consumer Electronics includes CDwrite software with the unit. Using simple commands from the DOS prompt, you can copy files from a hard disk or other storage device to a blank CD-R (recordable) disk. Though it is possible to make up to 99 multiple (or multivolume) recordings on one disk, you can read these additional volumes only by using the

CDD 521 with CDwrite. To make disks for playback on current CD-ROM players, you must make a full recording in one session without additions.

"Multisession" (or Mode 2) CD-ROM players that can read CD-R disks containing multiple recordings are expected to enter the market later this year, but standard (or Mode 1) CD-ROM players will not play back multisession disks. It is possible that additional software could make multisession recordings compatible with Mode 1 CD-ROM players, but none are currently available.

One other salient limitation of CDwrite is that the CDD 521 will recognize only file names that are alphanumeric. This is a restriction of maintaining com-

patibility with the ISO 9660 CD-ROM file-naming convention and the Microsoft MSCDEX driver. Consequently, it limits the recorder's use for archival storage, since many files in word processing applications contain tildes and other noncompatible characters. When the CDD 521 encounters such files, the copying process is aborted. Philips hopes to upgrade its software later this year to recognize all DOS filenames, but that capability may also depend on changes to the MSCDEX driver.

In every other respect, tests conducted on the CDD 521 ran smoothly. CD-ROM disks recorded on the Philips drive played back smoothly on a variety of CD-ROM players. We detected no further compatibility

problems with application or data files.

OPTIMIZED FOR RECORDING

The CDD 521 is clearly not intended as a substitute for a CD-ROM player. With a rated average access time of 1 second, the CDD 521's performance was slow in comparison with standard 380-ms CD-ROM drives. On PC Magazine Labs' CD-ROM throughput tests, which are designed to gauge the ability of the drive to read and transfer large amounts of data, the CDD 521 was not up to the speed of 150 kilobytes per second required to meet the Multimedia PC specification. Using a 2MB file, the average sequential throughput was 35.6 Kbps. According to Philips, the software currently shipped with the CDD 521 is optimized for recording and not for playback.

In recording tasks, the unit is quick. It can write to disks at double speed, meaning that a CD-ROM can be created in approximately 30 minutes (versus the 60 minutes required by the first generation of CD recorders). Using a 25-MHz 386 Compaq Deskpro/M, the CDD 521 took 1 minute 17 seconds to copy a 3.1MB directory from the hard disk.

Despite its current limitations, the CDD 521 is an exciting product for those users looking for a simple way to create single CD-ROMs for presentations, jukebox databases, or limited distribution of large amounts of data. Competing recorders are available from JVC, Sony, and Yamaha, but currently Philips' model is the least expensive and easiest to use in a PC environment.

• List price: Philips CDD 521 Compact Disc Recorder, with CDwrite software, one blank disk, SCSI adapter, \$7,995. Requires: 25-MHz 386DX PC with 1MB RAM, hard disk, DOS 4.01 or later. Philips Consumer Electronics Co., One Philips Dr., P.O. Box 14810, Knoxville, TN 37914-1810; 800-835-3506, 310-217-1300; fax, 310-217-1883. Circle 431 on reader service card

■ Cooking Up a Recordable CD

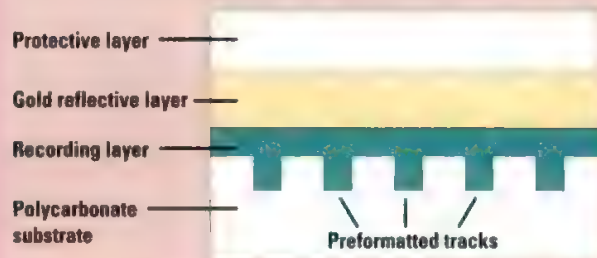
Though many of us have pined for recordable compact disks, turning the play-only CD into a recordable medium requires not only a new player/recorder, such as the Philips CDD 521 Compact Disc Recorder, but also a different type of disk.

A conventional CD contains a polycarbonate substrate with a spiral track containing pits. A thin reflective layer, usually aluminum, lies on top of the substrate, and its pits are detected by measuring the reflected light emitted by a small laser. The different values between pits and lands are then converted into digital information.

Recordable CDs work on the same principle, but they require special disks and a player/recorder with a high-power laser. A blank CD-R (recordable) has a prestamped polycarbonate base with spiral tracks but no pits. On top of the grooved substrate is a sensitive, green layer of organic dye, covered by a reflective layer of gold.

To write to a CD-R disk, a high-power laser heats the three layers. This causes the dye layer to fuse in spots, while the polycarbonate substrate expands up into the spaces left by the dye. This process forms pits in the grooves so the disk can be read like a conventional CD.—John R. Quain

A Recordable CD Cross Section

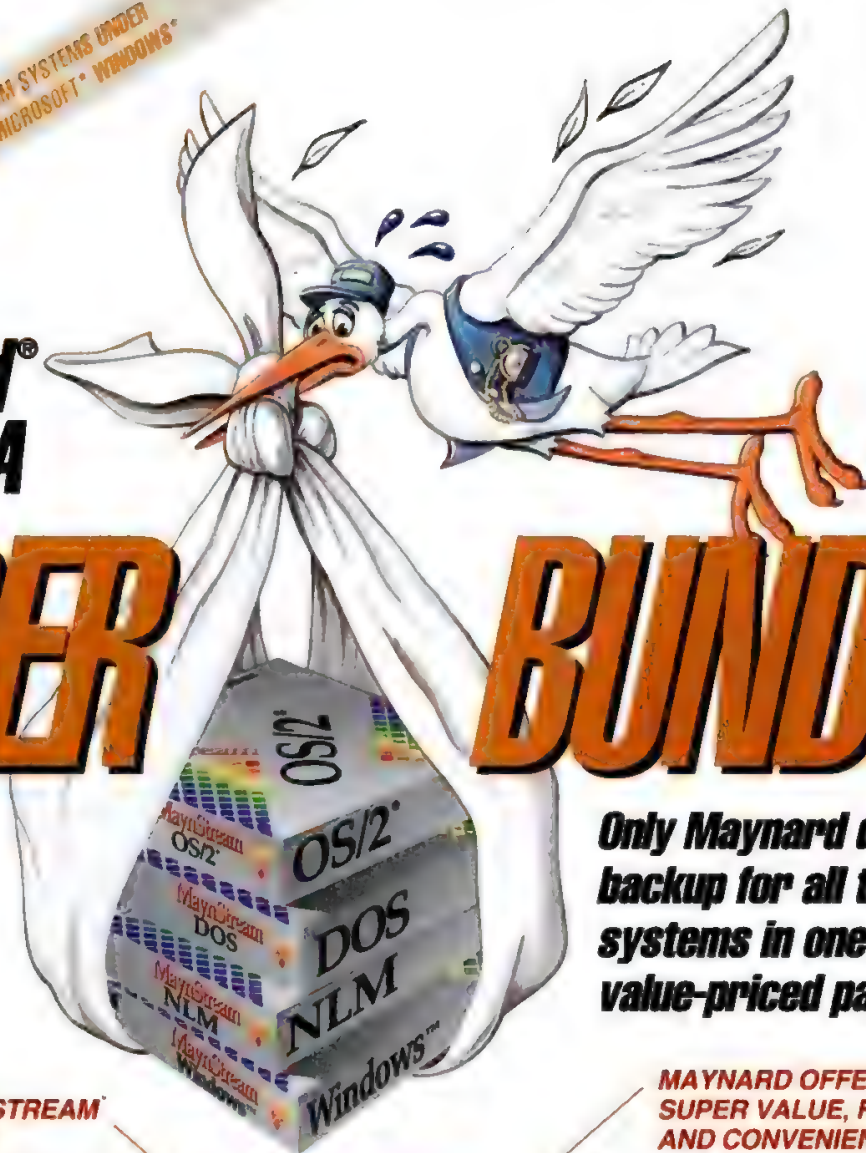


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■ Communications

Where's the Wire? Ericsson Modem Goes Anywhere

BY DON WILLMOTT

We'll see many great things in the future, but we won't see wires.

Ericsson GE Mobile Communications' new \$1,595 Mobidem modem is one of the first products to show how two-way wireless mobile computing can work today (pretty well) and how it will work very soon (much better).

In addition to the Mobidem, Ericsson is marketing a \$1,995 bundle called the Viking Express Kit that includes an HP 95LX palmtop computer and gateway software to let you access all kinds of e-mail systems.

The Mobidem has an RS-232 serial port that lets it connect to any PC, and it runs at an 8-kilobit-per-second data transmission speed on the radio link. A power-saving mode can keep the modem operational at a bare minimum, and the LCD indicates battery life, signal strength, and communication activity. The modem weighs 1 pound and has a 5.5-inch flexible antenna. The entire bundle comes in a black carrying case that's lined with Velcro so the components stay put when you travel.

RADIO NETWORK

The sending and receiving of messages happens via Mobitex packet-switched technology over a wireless data network run by RAM Mobile Data. Mobitex uses a scheme called seamless roaming, which simply means that your address is associated with your modem, not with your location (think of your office telephone number as a location-based address).

Wherever you are, the mo-

dem is scanning the network and checking in with the closest base station, just like a pager. The searching algorithm also keeps looking for the next-best radio contact, in case you start to lose the signal. The transmission cost is 25 cents per kilobyte, no matter what the distance involved.

Currently, the RAM Mobile network covers the top 50 U.S. metropolitan areas and several European locations. That range may cover most of your business travel needs, but it's important to note that right now, access is far from universal (100 metro areas served by 800 base stations are expected to be on-line by mid-1993).

Wireless communications does have its drawbacks. The Mobidem doesn't work well from windowless interior

rooms, and though we had no problems linking to the radio network on the streets or in a windowed office in Manhattan, the Mobidem was less consistent when we took it to Brooklyn—just 5 miles away from PC Magazine Labs—and tried to use it outdoors at street level. Spotty RAM Mobile coverage in Brooklyn was probably to blame.

ACCESS TO ALL E-MAIL

Through the Mobidem you can talk not only to others on the RAM Mobile Data network but also to anyone with any kind of

since RF services like RAM Mobile Data don't share stations with their competitors (Trends, April 14, 1992). A cellular data network called Celluplan II is being coordinated by IBM, a number of the Baby Bells, and others, and is expected to come on-line sometime in 1993.

CONCEPTUAL CHANGE

The big change is that the concept of dialing in for your messages goes away, along with that frustrating search for a data port in an airline terminal. As long as the modem is turned on, it receives messages from the radio network and puts them right on-screen, or into an 8K buffer if your connected PC is turned off. When you power up the PC, all your incoming mail downloads from the modem buffer and is ready to be read. The Mobidem display tells you the number of unread messages you have waiting.

Battery life runs up to 10 hours in power-saving mode, so one way to work is simply to keep the modem on all day,

pulling messages out of the sky. A recharger and extra battery come with the Viking Express Kit, and the entire package weighs 3 pounds.

Installed on the included HP 95LX is RadioMail Remote, a simple e-mail utility for managing your mail.

The whole wireless communications market is still in its infancy, and early adopters can naturally expect some growing pains. Competition from Motorola/IBM products connected to the ARDIS network will force prices down in 1993, and this technology should find its way into smaller form factors, including PCMCIA cards, soon. Still, it's exciting and thought-provoking to get a glimpse at the future in a product like the Mobidem that's available to try out today. □



RADIO DAYS: The bundle includes a wireless modem and an HP 95LX.

▶ FACT FILE

Viking Express Kit

Ericsson GE Mobile Communications Inc., Wireless Computing, 15 E. Midland Ave., Paramus, NJ 07652; 201-265-6600; fax, 201-265-9115

List price: Mobidem, battery charger, case, \$1,595, with HP 95LX, RadioMail Remote, \$1,995

In short: Two-way wireless communication arrives in a \$2,000 package that includes both the Mobidem wireless modem and an HP 95LX to manage your e-mail

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public e-mail account (MCI Mail, CompuServe, Internet, and the like) via the RadioMail gateway from Anterior Technology (415-328-5615).

The initial subscription to the service costs \$99, followed by an \$89 monthly fee that includes 100 50-word messages. Additional messages cost 29 cents each. You can also talk to the LAN e-mail system back at your corporate headquarters if the gateways are there. All you need is the right address coding.

How does all this compare with cellular systems? In a nutshell, cellular is more widespread but less robust, and is best for voice or for very large data files. Packet-switched radio frequency (RF) transmission is more stable and better for short bursts of data, such as e-mail messages, but it's less accessible,

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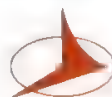
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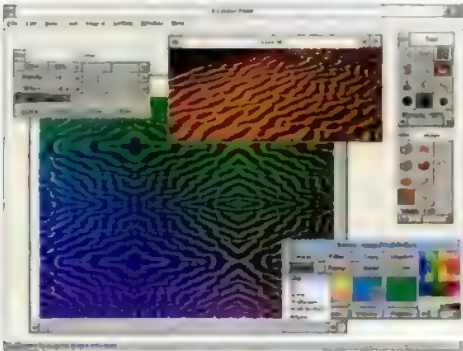
CIRCLE 148 ON READER SERVICE CARD

■ Graphics

Work Of Art: CA-Cricket Paint's Custom Painting Tools

BY LUISA SIMONE

The technology behind CA-Cricket Paint, the new \$595 24-bit Windows-based painting program from Computer Associates, can be summed up in one phrase: totally configurable painting tools. Each brush or painting function in Cricket Paint requires you to combine a tool, a shape, and a source. By mixing the 7 tools, 12 shapes, and 8 sources, you can literally invent new ways to paint.



MANIPULATION: This pattern uses a portion of a scanned photo as a reflected texture.

The possibilities are fascinating. For example, if you choose to use a rectangular or circular shape and the Area tool, you draw filled geometric figures. Use the same shapes with the Line tool and you'll create unfilled figures instead.

Understanding how the various sources affect your painting takes time, but the results are well worth the effort. In addition to solid colors, Cricket Paint lets you load your brush with gradient fills, quad gradients (each corner of the gradient contains a different color), filters (such as blur or brighten), unpaint (an eraser function), copy (cloning), or an image.

Several of the source options make Cricket Paint an image editor. With Filters as the

source, for example, you can blur, sharpen, or brighten the pixels in a picture. The Copy function lets you clone portions of a picture within the same window or between two different windows. Cloning is a great way to seamlessly combine two or more original images into a single picture because you can use cloning in conjunction with any tool or shape, anti-alias the edges, and determine the degree of transparency for individual brush strokes.

Of course, Cricket Paint is not a true image-editing program. Those users who want full-blown image-editing functions would be better served by programs such as Aldus PhotoStyler or Computer Associates' companion program, CA-Cricket Image.

Cricket Paint is first and foremost intended for artists who want to make pictures from scratch. But once again, the Source options are a key that can unlock your creative impulses. For example, most painting programs let you fill an area with a pattern. Cricket Paint leaves that notion far behind and lets you use any image (or portion of an image) as your painting source.

To get the most punch out of Cricket's painting tools you must master a multitude of configuration options. In addition to choosing a tool, a shape, and a source, Cricket Paint lets you set the level of transparency, the width of a line, the texture of a brush stroke, and the amount of anti-aliasing. By ad-

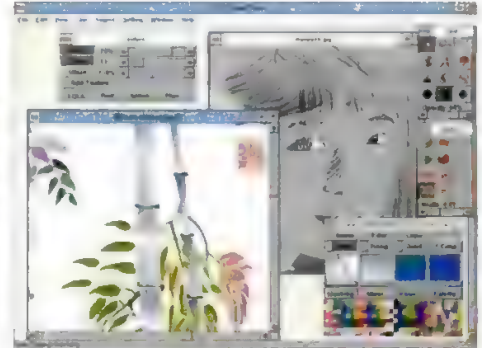
justing these settings you can successfully mimic traditional painting and drawing techniques such as watercolor, crayon, charcoals, and even felt-tipped markers. You simulate watercolors, for instance, by using a densely dotted texture, an extremely soft edge, and very transparent paint.

Unfortunately, once you've developed the perfect painting tool

you can't save the settings as a custom brush, so you must constantly fiddle with configuration options as you switch from tool to tool. Worse, it's difficult to keep track of all of the settings or even to see the painting through the clutter of palettes and dialog boxes, though the program does display the cur-

rent tool, shape, source, and texture at the bottom of the screen. You can also temporarily remove the palettes from view with the right mouse button.

Despite these inconveniences, Cricket Paint is chock-full of powerful features. Sophisticated 8-bit masks can protect either an area of a canvas or specified colors. Editing tools let you cut, paste, scale,



LIFELIKE: CA-Cricket Paint can mimic art media such as watercolor or charcoal.

and rotate selected portions of an image. And you can create special effects such as sunlight glinting on water, whirlpools of color, and bas-relief by using commands such as gleam, barrel distort, or emboss.

Cricket Paint takes full advantage of the Windows environment. The program can access any Windows font, including scalable ATM and TrueType fonts. In addition to standard Windows file formats such as .BMP and .WMF, the program supports both compressed and uncompressed TIFF as well as JPEG formats.

You don't need a 24-bit graphics adapter to run CA-Cricket Paint. The program will operate with 16-bit or 8-bit displays, making it a high-end paint program that doesn't require a high-end hardware investment.

The powerful Fractal Design Painter is Cricket Paint's only competitor right now, but unlike Painter, CA-Cricket Paint combines the conveniences of editing tools with the ability to mimic painting techniques. For serious image makers, that combination may prove to be the best of both worlds. □

▶ FACT FILE

CA-Cricket Paint, Version 1.0

Computer Associates
International, 1 Computer
Associates Plaza, Islandia, NY
11788; 800-225-5224; 516-342-
5224; fax, 516-342-5329

List price: \$595 (\$695 bundle of CA-Cricket Paint and CA-Cricket Image available through 1/31/93).

Requires: 386 CPU or better, 2MB RAM (4MB suggested), 1.4MB hard disk space, Windows 3.0 or later, mouse or digitizing tablet.

In short: At \$595, CA-Cricket Paint may be priced beyond the means of casual or occasional users, but serious image-makers will admire the flexibility of this 24-bit paint program.

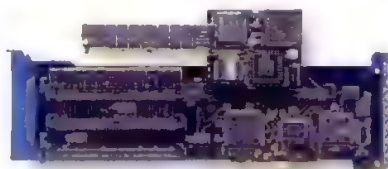
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■ Portable PCs

The \$595 Zeos Pocket PC: An Exercise in Compromise

BY GREG PASTRICK

Positioned to cover the market between hand-helds and sub-notebook PCs, the Zeos Pocket PC's 1.3-pound weight, \$595 price tag, 1- by 9.6- by 4.5-inch (HWD) form factor, and two PCMCIA slots are just about right. Its 286-like NEC V30 microprocessor, 1MB RAM storage, stripped-down DOS 5.0, tight .65-inch key-spaced keyboard, and ROM-based software (including Microsoft Works) are all wrong.

The 7.3-inch reflective LCD is a 25-line, 640-by-400 CGA panel

that's readable in optimal lighting conditions, but the alkaline battery power is less than optimal. On our battery rundown test, we found that you can expect up to 10 hours of unassisted



PCMCIA: Cards for extra flash memory and program storage load into trays.

power from two fresh AA batteries in the Pocket PC. Its tiny backup lithium hydride cell will give you little more than 3 minutes of reserve once the AAs run out.

The Pocket PC is caught in a race to reach consumers who need a portable communicator with some basic computing functions more than they need a general purpose computer.

The Pocket PC has optional 512K, 1MB, and 2MB flash memory cards for its two 3.3-mm Type I slots, but you end up with little extra storage for an extremely high price. Add \$898 to the Pocket PC's list price for 4MBs of extra PCMCIA card-based flash memory.

What's more, the Pocket PC's Type I slots won't handle available PCMCIA modem cards, which fit only Type II 5-mm-high slots. If you want a portable modem, it'll have to be an external one, such as the \$249 Zeos send/receive pocket-size

9,600-bps fax and 2,400-bps modem unit. The fax software comes on a PCMCIA card, so you temporarily lose a storage slot in the deal.

On the road, all that many of us really need is a word processor, spreadsheet, file-transfer utility, and communications program. You get all that preloaded with the Zeos Pocket PC, plus a personal contacts database, a calendar/planner, a calculator, and international travel information. But if you don't want to compromise on performance to save pounds, you should probably pass this portable by.

• **List Price:** *Zeos Pocket PC, with DOS 5.0 system files, Microsoft Works 2.0, 1MB RAM, lithium hydride backup battery, AC adapter, and carrying case, \$595. Zeos International Ltd., 530 5th Ave. NW, St. Paul, MN 55112; 800-423-5891, 612-633-4591; fax, 612-633-8296.*

Circle 424 on reader service card

■ Multimedia

Macromedia's Action! 2.0 Adds Animated Charts to Its Presentation Toolkit

BY STEVEN ROSENTHAL

The addition of animated data-driven charts and a royalty-free runtime player makes Version 2.0 of Macromedia's \$495 Action! a well-rounded tool for creating animated slide show-style presentations, on-disk tours, and other intermediate-level multimedia projects. But while these and other new features haven't lessened the program's outstanding ease of use, this release still has some anomalies and rough edges.

As in the previous version, Action! lets you create presentations out of a series of scenes (slides) in which you can place bitmapped graphics, draw-style objects, animated movies, and now charts. Any object can also act as an on-screen button, and all objects except backgrounds

can be given motion, duration, and entrance/exit transitions. On a PC with a sound card, buttons or scenes can also invoke waveform or MIDI sound files.

As you create your presentation, you can work in a basic scene view, in a timing-chart window, in an outline view, or in a slide-sorter window. Most characteristics can also be set directly for each object from one or more corresponding dialog boxes.

The Action! 2.0 package includes a set of more than 100 templates and a starter set of clip art and waveform sound files to get you going (but no MIDI files). You can also begin a new presentation from scratch, or you can now import

individual slides or complete presentations from popular packages such as Lotus Freelance for Windows, Harvard Graphics, or Aldus Persuasion.

The new charting feature lets you pick your basic chart pattern from a gallery containing a variety of line, bar, pie, and 3-D charts. Individual chart elements also can be given motion

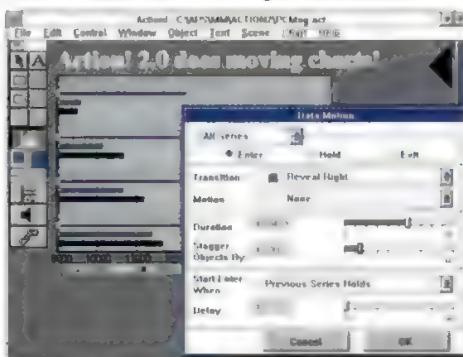
apps that support DDE (Dynamic Data Exchange).

Once you get your presentation the way you like it, you can print out paper notes or "print to videotape" (which really only sets full-screen mode and starts the presentation off, leaving any videotape interface to external hardware and software).

On the negative side, the README file that comes with Action! lists dozens of anomalies you need to watch for, the introductory videotape needs work, and the program lacks some fairly standard features, such as default filenames in the Save dialog. But on balance, Action! remains a quick and powerful way to create sophisticated animated presentations.

• **List Price:** *Action!, Version 2.0, \$495. Macromedia, 600 Townsend St., San Francisco, CA 94103; 800-288-4797, 415-442-0200; fax, 415-442-0190. Requires: 2MB RAM, 3.5MB hard disk space, Windows 3.0 or later.*

Circle 425 on reader service card



MOTION: Action!'s chart animation dialog.

and duration, letting you create charts that build up data series or reveal figures over time. You can enter data directly, import values in common worksheet and database formats, or link the data in from other Windows

THIS IS THEIR IDEA
OF A GOOD DEAL.

BIGTIME ORCHARDS

SALE



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CAN'T BEAT GATEWAY 2000!



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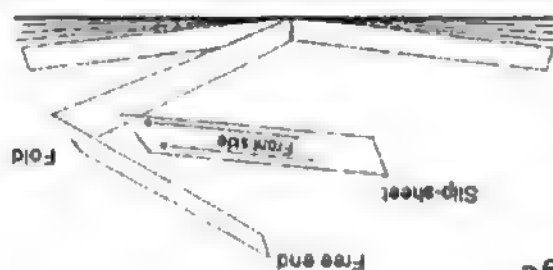
Back

GbslipBack-0018



Inverted Back

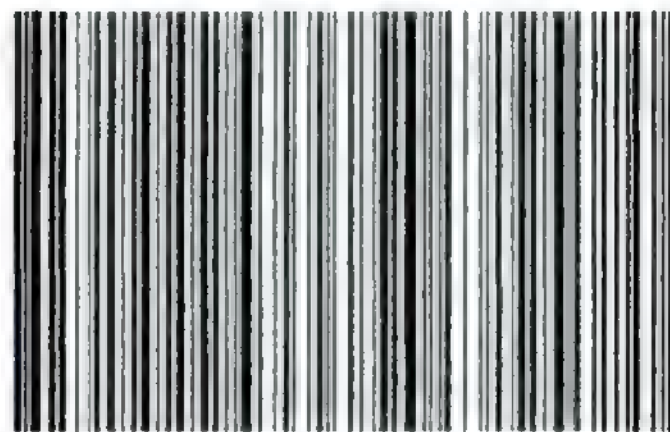
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APPLES TO APPLES, YOU



The "Orchard" people are all Gateway 2000 employees, photographed at P.B. Apple Orchard in Stormy City, Iowa.

**THIS IS OUR IDEA
OF A GOOD DEAL.**



BIGTIME ORCHARDS



With all the price padding going on in the industry, the PC crop looks luscious — but inspect closely before you bite. When you compare apples to apples, you'll find Gateway 2000 is the only company where a bushel is still a bushel. And a dollar buys more today than it did yesterday. That's value. That's the Gateway 2000 difference.

WHEN YOU'RE PICKING A PC, COMPARE PERFORMANCE AND FEATURES!

Now, more than ever, it's important to compare apples to apples before you pick your PC. You can be looking at two 486SX machines and actually be comparing an apple to an orange. What's inside makes a big difference. Other manufacturers do whatever it takes to hit a price point, and the 486SX you thought was a peach may turn out to be a lemon.

CPU's. Hard drive. Video. These subsystems have a big effect on system performance. They are also totally interrelated. One bad apple can indeed spoil the whole bunch. You also might find that extra features from one company can upset another's applecart.

The trick is to weed through PC manufacturers to find the one that's perfected the recipe. You need the right ingredients mixed together in just the right way: the smartest system features, the quality of the components, the company's strength and a reputation for the best, most knowledgeable service.

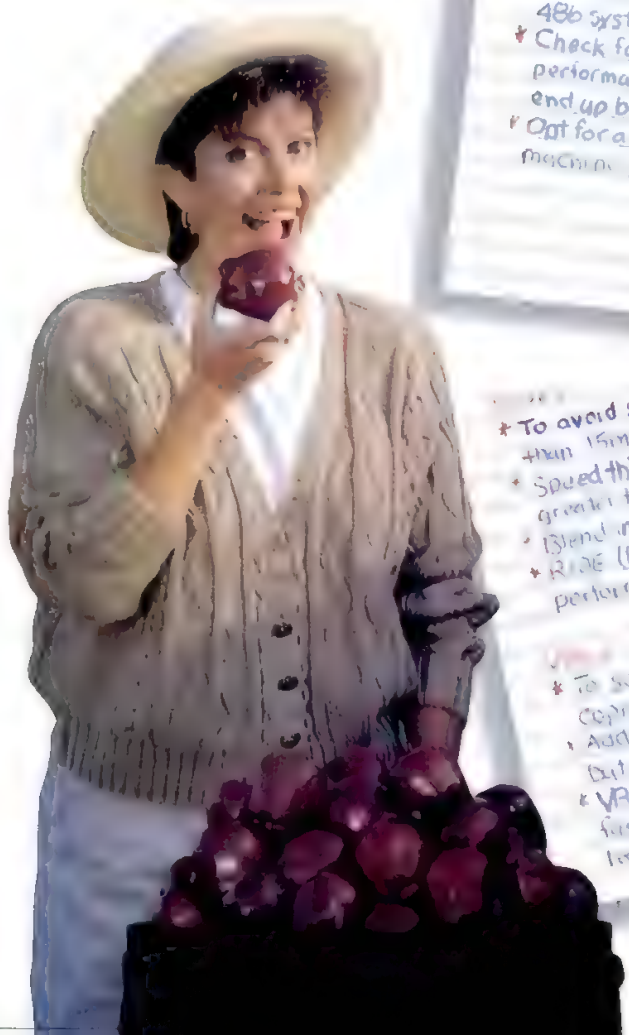
To help you peel away the hype, here are some secret recipes to help you compare performance and features:

Recipe for Peak Performance

- * Preset your PC for tomorrow's software by choosing a 486 system — 486 CPUs are designed for all your power-hungry applications.
- * Keep in mind that a 486DX 25 will outperform any 386 system on the market.
- * Hint: 486 systems are easily upgradeable to higher levels of performance, that's why 90% of all Gateway customers buy 486 systems.
- * Check for memory cache for optimal processor and memory performance. 64k is your best choice — more than 64k could end up being table scraps.
- * Opt for a clock-doubled 66MHz 486DX 2 system for the fastest machine you can buy.

- * To avoid slow cooking, make sure your access time is less than 15ms.
- * Speed things up with Data Transfer Rates (DTR) buffer to disk greater than 12Mb per second.
- * Blend in at least 32k of cache.
- * RAID (Rapid Integrated Drive Electronics), Gateway's exclusive disk performance enhancement, will spike up your performance even more.

- * To serve up the best Windows performance, look for Coprocessor video.
- * Adding a local bus video will give you the best video performance. But avoid proprietary local buses.
- * VRAM vs. DRAM: Don't settle for stale ingredients — VRAM provides faster video implementation. But whatever you use, you'll need at least 1MB RAM for a veritable palette of colors.



Free Application Software

It's ripe for the picking at Gateway 2000! Each Nomad comes with MS Works™ and each 486 desktop or tower system comes with your choice from the option list on the last page of this ad.



Components, peripherals and software are sold only with the purchase of a system, or to customers who already own Gateway 2000 systems. Some limitations apply.

Software options include identical applications contained in retail packages but will not include the retail box. You get all master diskettes and manuals, shrink-wrapped and packaged in a Gateway 2000 box.

Features à la Gateway

RAM

- * For the best results, start out with a minimum of 4MB, although we recommend 8MB.
- * Make sure your machine is expandable to at least 16MB, but to really be set for the future, look for upgradeability to 64MB.

Drives

- * Start with a bare minimum of 80MB. But remember, you can never add too much — the more, the better!
- * Add both 5.25" and 3.5" floppies. Make sure they're quiet and reliable.

Monitors

- * Start out with a 14-inch color monitor.
- * Upgrade to a 15-inch color monitor with a flat, square, non-glare screen for a larger, brighter viewing area.
- * Make sure your monitor supports 1024 x 768 resolution and look for a 0.28mm dot pitch.
- * A non-interlaced monitor is best.

Software

- * Your system should include Microsoft® DOS® 5.0 and MS Windows™ 3.1, installed and ready to run.
- * Toss in your choice of free application software options pre-installed — all manuals and diskettes included.

Keyboard

- * For a great combination, add a programmable keyboard with more than 101 keys. Mix in two sets of function keys.

To Top It All Off

- * Refreshing custom cases in a distinctive cool gray color and contemporary design.
- * A full fare of custom-written system manuals.
- * Don't forget agency approvals — UL, FCC Class B and CSA.
- * All packaged in Gateway's own world-famous "cow-spotted" boxes.



THE ULTIMATE TEMPTATIONS IN PORTABLE PCs

The Nomad

Your choice of a notebook depends on what you're doing away from the office. Our small, lightweight Nomad notebook computers give you desktop performance no matter where you are.

PC Magazine reports, "Geared to low power consumption, Gateway 2000's Nomad line offers excellent battery life, light weight, quality performance, and a highly competitive price."

Computer Shopper added, "The Nomad is far and away the best laptop around for getting the maximum value out of a single battery charge."

"...(it's) clearly the best general-purpose choice (for a notebook computer)."

And with our 486 Nomads, you don't have to sacrifice performance for portability. You get a bushel basket full of standard features!

The HandBook™

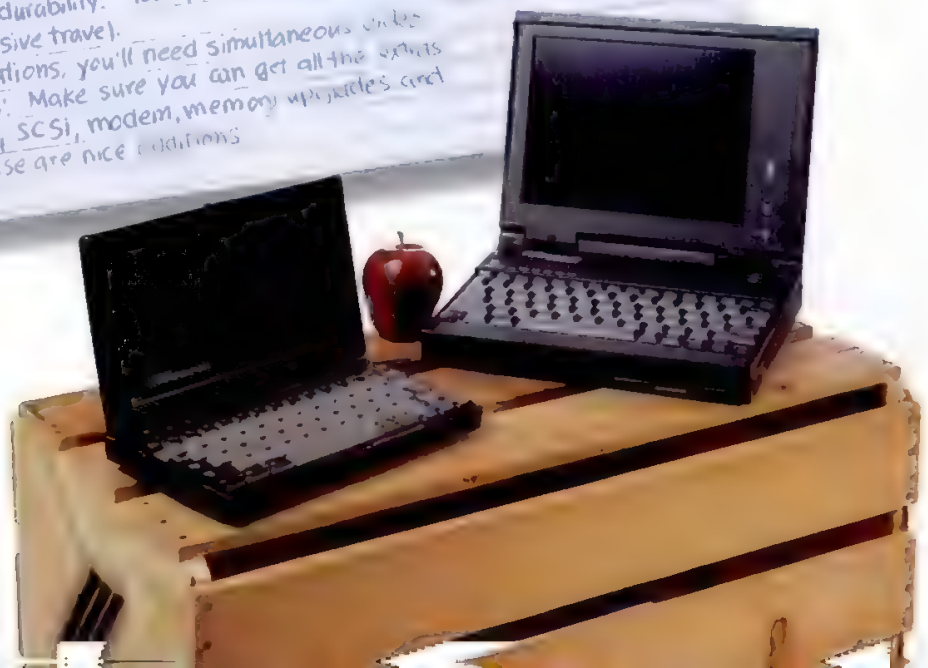
Sometimes a product is so special, it's just not possible to compare it to anything else. And that's the way it is with our one-of-a-kind HandBook — a real PC in miniature form!

It weighs just 2.75 pounds and measures 6 x 9 inches. Yet it delivers 286-class performance and speedily runs all your favorite DOS applications with a bright backlit screen, a bonafide 40MB hard drive and a comfortable 78-key keyboard (no chiclet keys). And you get up to 4.5 hours battery life with power management.

Your HandBook arrives with MS-DOS® 5.0, LapLink® XL from Traveling Software, MS PC Works™, and Central Point® Desktop pre-installed and ready to run. A serial cable is included for downloading to your desktop.

Travelers' Take-Outs

- * Don't settle for small portable desktop performance — with portability when looking to run Windows apps on the road
- * And 11.3" and 64MB RAM
- * Your HandBook should be at least 50MB
- * Keep it light — your portable PC should weigh no more than six pounds
- * Include the battery and it should be small enough to take anywhere
- * A backlit, 10-inch high resolution VGA screen.
- * A battery life greater than six hours.
- * Stir in MS-DOS 5.0, Windows 3.1 and a portable printing device
- * An added treat is to find application software pre-installed
- * Reliability & durability! Your portable PC should be able to take a beating during extensive travel.
- * For presentations, you'll need simultaneous color
- * Accessories! Make sure you can get all the extras Networking, SCSI, modem, memory upgrades, and carrying case are nice additions



An Extra Slice For Gateway Customers

Gateway customers become members of an exclusive club, able to purchase peripherals, upgrades, and additional software applications at special prices.

The 15-Inch CrystalScan 1572FS

A flat, square, non-glare screen reduces distortion around the corners and provides edge-to-edge display – an upgrade option with the purchase of any Gateway 2000 desktop system for an additional **\$195**.

The Gateway 2000 TelePath™ Fax/Modem

A 14,400 bps mode, V.32bis, with 9,600 bps fax capability. The TelePath comes with WinFax Pro™, Crosstalk™ for Windows, Qmodem™ and a free 30-day basic services CompuServe® membership – all for only **\$195!**

More Software At Great Prices

The following applications are available with the purchase of a system, or to Gateway customers.

**Central Point® Anti-Virus 1.2
for Windows \$75**

**Central Point Backup™ 7.2
for Windows \$75**

**The Norton Desktop™ 2.0 and
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(personal information manager) \$95**

Also available –
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Call for details.

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 - Payment options — major credit cards and C.O.D. terms; net 30-day credit terms and leasing options are available to qualified commercial customers.
- 



Your No-Fail Recipe for Satisfaction

[illegible]

Sorry, we sell peripherals only with the purchase of a Gateway 2000 system, or to people who are already Gateway 2000 customers.

GATEWAY 2000 ORCHARD'S BEST

PORTABLES

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- 286 Class Performance
- 1MB RAM upgradeable to 3MB
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- Size 5.9" x 9.75" x 1.4", 2.75 Lbs.
- 4.5-Hr.* NiMH Battery & AC Pack
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- 25MHz, 386SXL Processor
- 4MB RAM
- 1.44MB 3.5" Drive
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- Backlit 10" VGA Screen, 64 Grays
- Simultaneous Video with 256K
- Size 8.5" x 11" x 1.8", 5.8 Lbs.
- 6-Hr.* NiCad Battery & AC Pack
- 1 Parallel/1 Serial Port
- 79-Key Keyboard
- FieldMouse™ Pointing Device
- MS DOS 5.0 and Windows™ 3.1
- MS Works™ for Windows

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NOMAD 445XL

- 20MHz, Intel® 486SXLP Processor
- 4MB RAM
- 1.44MB 3.5" Drive
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- Backlit 10" VGA Screen, 64 Grays
- Simultaneous Video with 1MB
- Size 8.5" x 11" x 1.8", 5.8 Lbs.
- 6-Hr.* NiCad Battery & AC Pack
- 1 Parallel/1 Serial Port
- 79-Key Keyboard
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- MS DOS 5.0 and Windows 3.1
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NOMAD 445XL

- 25MHz, Intel 486DXLP Processor
- 4MB RAM
- 1.44MB 3.5" Drive
- 120MB IDE Hard Drive
- Backlit 10" VGA Screen, 64 Grays
- Simultaneous Video with 1MB
- Size 8.5" x 11" x 1.8", 5.8 Lbs.
- 6-Hr.* NiCad Battery & AC Pack
- 1 Parallel/1 Serial Port
- 79-Key Keyboard
- FieldMouse Pointing Device
- MS DOS 5.0 and Windows 3.1
- MS Works™ for Windows

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DESKTOPS

25MHz: 386SX

- Intel 386SX Processor
- 4MB RAM
- 1.2MB & 1.44MB Drives
- 80MB 15ms IDE Cache Drive
- 16-Bit SVGA with 1MB
- 14" CrystalScan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey™ Keyboard
- Microsoft® Mouse
- MS DOS 5.0 and Windows 3.1
- MS Works for Windows

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25MHz: 486SX

- Intel 486SX Processor
- 4MB RAM
- 1.2MB & 1.44MB Drives
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- ATI™ Graphics Ultra with 1MB
- 14" CrystalScan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

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33MHz: 486DX

- Intel 486DX Processor
- 64K Memory Cache
- 4MB RAM
- 1.2MB & 1.44MB Drives
- 200MB 13ms IDE** Cache Drive
- ATI Graphics Ultra with 1MB
- 14" CrystalScan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$2295

50MHz: 486DX2

- Intel 486DX2 Processor
- 64K Memory Cache
- 8MB RAM
- 1.2MB & 1.44MB Drives
- 200MB 13ms IDE** Cache Drive
- ATI Graphics Ultra with 1MB
- 14" CrystalScan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$2595

66MHz: 486DX2

- Intel 486DX2 Processor
- 64K Memory Cache
- 8MB RAM
- 1.2MB & 1.44MB Drives
- 340MB 13ms IDE** Cache Drive
- Ultra Fast Local Bus Video
- 15" CrystalScan 1572 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$2995

66MHz: 486DX2 Easy

- Intel 486DX2 Processor
- 128K Memory Cache
- 8MB RAM
- 1.2MB & 1.44MB Drives
- 340MB 15ms SCSI Cache Drive
- 32-Bit EISA SCSI Controller
- 16-Bit SVGA with 1MB
- 14" CrystalScan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0 and Windows 3.1
- Choice of Application Software

\$3995

SOFTWARE CHOICES

- Microsoft® Excel for Windows™ 4.0
- MS Word for Windows™ 2.0
- MS PowerPoint for Windows™ 3.0
- MS Project for Windows™ 3.0
- Borland Paradox® 4.0 and Turbo Pascal 1.5 or C++® 3.1
- The MS Entrepreneur Pack (Works™, Publisher™, Money™ and Games)
- The Windows Programmer Pack (MS QuickC™, Visual Basic, and More)
- MS Office™ (Word, Excel, and PowerPoint) Available as an upgrade replacing any above option.

**Enhanced IDE with RIDE (Rapid Integrated Drive Electronics)

* Battery life was measured using PC Magazine's Battery Rundown Test with power management enabled. Actual results may vary.



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Reference

An Etymologist's Dream: The OED on CD-ROM

BY RUBIN RABINOVITZ

The \$895 Oxford English Dictionary (Second Edition) on Compact Disc is a monumental reference work boasting the combination of massiveness and precision you'd find in a steam roller built by Rolls Royce.

After the original ten-volume OED was completed in 1928, it became necessary to issue supplements listing new words, particularly technical and colloquial terms. In 1989, a new edition incorporating the added material was published, and now the second edition has been released on CD-ROM. OED2 on CD requires Microsoft Windows for its front end (it won't run under DOS), and a CD-ROM player—preferably a fast one, because some of its routines are time-consuming.

OED2 on CD is a language-maven's dream: impressively erudite, irrefutably accurate, exhaustively comprehensive, and so addictively entertaining you'll

find it hard to stop browsing through it. The electronic version goes a number of steps beyond its printed counterpart. Of course, looking up words is faster and easier than before (especially if you've been squinting through a magnifying glass at the compact edition's microprint font). But the electronic dictionary's biggest ad-

vantage comes from its powerful search routines: More storage space on the CD is used for search programs than for dictionary entries. As a result, you can extract information from the dictionary in ways that weren't possible before. A printed dictionary's alphabetical listings will give you related words with similar prefixes, but locating those with similar suffixes can be a chore. The wildcard searches in OED2 on CD make it simple to find this and other groups of related terms, such as those ending with -ism, -ology, or -phile. In the same way, you can find groups of words that are similar in meaning or etymologically linked, and all these results can be copied into the Windows Clipboard.

OED2 on CD has filters for limiting the range of a search; instead of requesting all of the words ending in -ly, you might ask for subgroups of adverbs or adjectives with that suffix. Other filters restrict searches to the etymological, phonetic, definitions, or quotations sections of the dictionary.

Proximity searches can be used to find contiguous words; thus, if you want the names of purple flowers, a proximity

search can scan the definitions section looking for entries that mention purple and flower in conjunction. Still another option lets you use chronological variables to find words or citations that appeared within a certain span of years.

For its more complex searches, OED2 on CD utilizes a query language resembling those found in database programs. The results of such searches are sent to special files that can later be retrieved for viewing, particularly helpful for time-consuming searches.

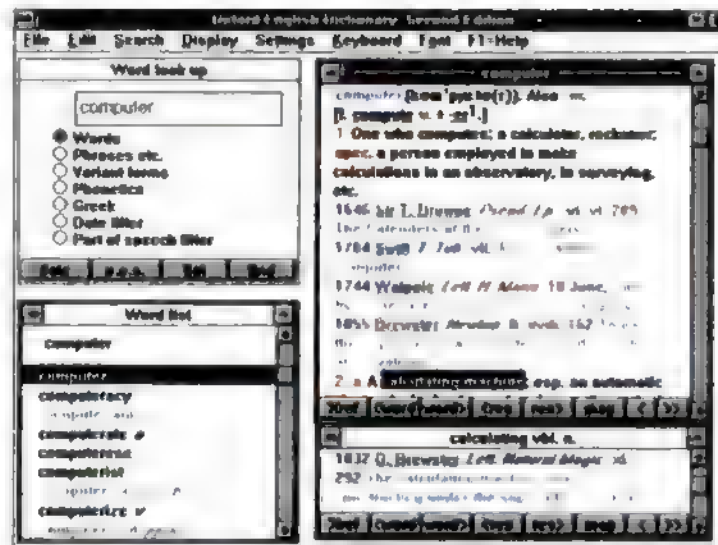
If you key in a misspelled word, OED2 on CD automatically moves to a legitimate term that resembles it. Another useful feature lets you shade a word in the definition text and, by clicking on a cross-reference button, display a window with that word's meaning. Other buttons move you to adjacent entries quickly and show how complex definitions have been organized.

OED2 on CD has a few minor problems: Some routines could be simpler and its manual could be clearer and more thorough (needed, for example, are tables listing abbreviations, symbols, and default-color assignments). Unlike many electronic dictionaries, the program won't read from or paste into standard word processors, and it has no shortcut routine for defining a word quickly.

OED2 on CD is an outstanding program, unquestionably one of the most important reference works ever published in electronic form. And at \$895, it's almost \$2,000 cheaper than the paper version. Does that make it a bargain? Answer that question and you'll know if you're a true lover of language.

• **List Price:** *The Oxford English Dictionary (Second Edition) on Compact Disc*, \$895. Requires: 4MB RAM, Microsoft Windows 3.0 or later, CD-ROM drive. Oxford University Press, Electronic Publishing, 200 Madison Ave., New York, NY 10016; 800-334-4249, 212-679-7300.

Circle 423 on reader service card



CROSS-REFERENCES: Pressing OED2's XREF button displays cross-references.

■ The Numbers Behind the Words

The Second Edition of The Oxford English Dictionary is awe inspiring: over a century in the making; hundreds of thousands of contributors; 615,500 entries (college dictionaries have less than 200,000); 137,000 pronunciation guides; and 249,000 etymological listings. The longest entry is for "set": OED2 uses 60,000 words (about 150 standard book pages) to define its 154 main senses.

On paper, the dictionary's 60 million words of text are printed in 20 phone book-size volumes whose 137 pounds can make a sturdy bookshelf creak. Much of that space is given over to 2.4 million quotations (33,150 are from Shakespeare, the author

most often cited). This is the feature that sets OED2 apart from other dictionaries: a wide-ranging collection of pointers back into literary history that illustrate how words have changed over time. You learn not only when and where a word first appeared, but also how it has evolved.

"Computer," for example, originally meant not a machine, but a person employed to make calculations; Jonathan Swift used it in this sense in 1704. In 1897, computer was used to describe a circular slide rule; in 1941, to describe a device for positioning a telescope; and only as late as 1944 in its modern sense. —RR

Video

Number Nine's Ecstasy Board: True Color, Virtual Screen

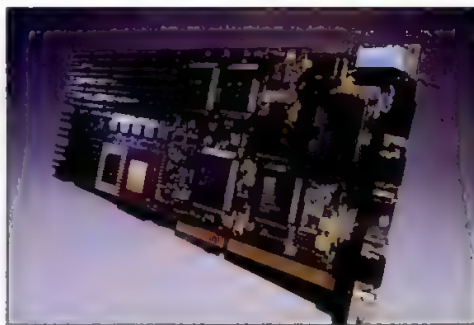
BY BEN MYERS

Number Nine Computer Corp. dubs its \$2,295 #9GXITC graphics board the Ecstasy. It provides a large canvas for viewing and manipulating true-color (16.7-million-color) and high-color (65,536-color) graphics images and drawings.

The latest in a series of cards based on the Texas Instruments 34020 graphics coprocessor, the Ecstasy supports true-color resolutions up to 1,024-by-768 and high-color up to 1,280-by-1,024.

The Ecstasy permits virtual screen operation for 65,536, 256, or 16 colors under the Windows environment. With a virtual screen, your monitor serves as a window through which you see a segment of the entire virtual area. You may choose, for example, to view an 800-by-600 portion of a 2,048-by-2,048 virtual screen. The Ecstasy Windows driver pans your view within the virtual screen as you move the Windows cursor to an edge of the current view. A vir-

tual screen is useful for quick navigation within a large spreadsheet or document or for moving among several applications that would otherwise occupy the entire screen.



HIGH-END: The \$2,295 #9GXITC Ecstasy.

Like its #9GX predecessors, the Ecstasy lets you zoom in on an area of a Windows screen with magnification up to 16 times the normal size. A graphics artist would put the zoom feature to good use when editing an image or drawing pixel by pixel, with a less than steady hand and little resulting eyestrain.

Both zooming and the virtual screen are managed almost entirely by the TI 34020 graphics coprocessor with minimal interaction with your PC, so both appear to be almost instantaneous.

The Ecstasy is a full-sized ISA bus card that's loaded with 4MB of fast VRAM to store graphics bitmaps, 2MB of DRAM to hold downloaded TI 34020 software, and an ACUMOS VGA chip (from Oak Technology).

Hardware installation is a trouble-free process. A set of hardware switches provides eight possible choices to handle conflicts with any other boards

installed in your PC.

The setup program lets you choose an 8K range of upper memory to use as a graphics buffer, the TIGA (Texas Instruments Graphics Architecture) driver software interrupt, the maximum resolution supported by your monitor, and the horizontal scan rate. It also has a utility to center and resize a given graphics resolution on-screen, helping you deal with widely varying monitor timing frequencies that are not yet standardized.

As with nearly all TIGA graphics boards, using the Ecstasy is a two-step process. A TIGA TSR (terminate-and-stay-resident) program manages the direct inter-

file, and the TSR can be unloaded from memory whenever a non-TIGA software program needs the extra memory.

Number Nine also provides a VGA pass-through cable for use with a second graphics adapter in a PC, a cable for monitors that use separate RGB connectors, and a VGA terminator plug to prevent ghosting of images on-screen when the second adapter is in use.

A separate installation program sets up the Number Nine Windows drivers and installs the set of Windows icons used to customize function keys for zooming, choosing the color for Windows icons, and setting up a new resolution. These features are not available in the standard TIGA drivers included with Windows 3.1.

With the Ecstasy, Windows startup takes a few seconds longer than with a less intelligent graphics card because the software resident on the board is downloaded by the Windows driver.

Performance under Windows with 16 million colors is certainly acceptable, although slower than with 16 or 256 colors. It would be nice to have 16.7 million colors in the virtual screen, but the board doesn't have quite enough memory for that.

Rounding out the software supplied with the Ecstasy card are a Display List Driver for AutoCAD, Releases 10 and 11, and various utilities and drivers that enhance software that operates with the VGA chip.

The only agony that comes with the #9GXITC Ecstasy is its \$2,295 price tag, which puts it between similar boards from Matrox and VideoLogic that range in price from \$995 to \$2,995 (discussed in First Looks, July 1992). If you need the high-end features, though, Number Nine's Ecstasy board may help you to become a computer-age Michelangelo. □

Graphics Winmark Test

With a score of over 5 million, the \$2,295 #9GXITC Ecstasy board outperformed the \$995 Matrox Impression 1024 and the \$2,995 VideoLogic Rapiere 24 when tested at 1,024-by-768 resolution with 256 colors.

The Graphics Winmark is the geometric mean of 12 WINBENCH graphics tests, measured in millions of pixels per second. The Winmark takes into account tests of 12 key video functions and weights them to reflect how frequently the functions are used. Higher scores represent better performance.

Diamond Stealth VRAM (8-bit)	6.09
#9GXITC Ecstasy (24-bit)	5.13
VideoLogic Rapiere 24 (24-bit)	3.69
Matrox Impression 1024 (24-bit)	1.79

face with the graphics board. Windows, AutoCAD, and other software operates with its own TIGA drivers, which request graphics operations through the TSR. The TSR is normally run from your AUTOEXEC.BAT

FACT FILE

#9GXITC Ecstasy

Number Nine Computer Corp.,
18 Hartwell Ave., Lexington,
MA 02173; 800-438-6463, 617-
674-0009; fax, 617-674-2919

List price: \$2,295

In short: The #9GXITC Ecstasy has a TI 34020 graphics coprocessor for high-resolution Windows and AutoCAD use with up to 16.7 million colors. Its virtual screen, zooming, and panning are noteworthy productivity features.



ON READER SERVICE CARD

The most advanced Windows spreadsheet starts with an elementary concept

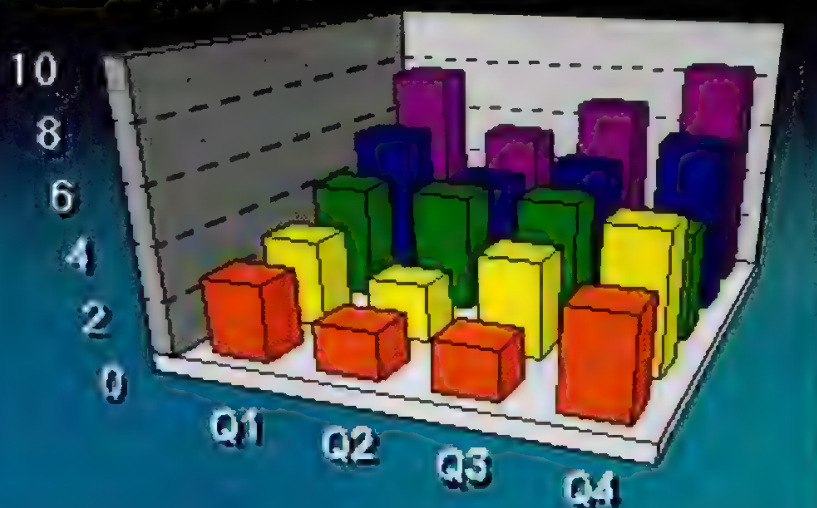


Introducing Quattro® Pro for Windows.

B O R L A N D

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Regional Sales 1992



Totals Qtr1 Jan Feb Mar Qtr2 Apr May Jun Qtr3 Jul Aug Sep Qtr4

...Spreadsheet

Quattro Pro for Windows is the most usable spreadsheet ever made. Built with Borland's renowned object-oriented technology, Quattro Pro for Windows* is packed with hot new features you won't find in any other spreadsheet.

NEW! Spreadsheet Notebooks* with customizable Tabs are nothing less than a revolution in spreadsheet ease of use. Now you can intuitively organize and manage your spreadsheet data.

NEW! Object Inspector™ menus end the hassle of searching through menus. They're simpler than 1-2-3. Just click the right mouse button anywhere on the screen to get a list of what you can change and change it right there.

NEW! Database Desktop is the easiest way to incorporate dBASE® and Paradox® data into your spreadsheet. Just what you'd expect from Borland, the leader in database technology.

NEW! SpeedFill™ and **SpeedFormat™** slash setup time by automatically filling in spreadsheet headings and formats.

NEW! SpeedBars™ are context-sensitive and customizable. SpeedBar icons give you pushbutton access to your most frequently used commands.

NEW! Presentation Graphics and drawing tools that rival those of Freelance and Harvard Graphics are built-in. You don't need to buy a separate graphics package.

YES! Compatible with Lotus 1-2-3 files, macros, and publishing styles and with Excel .XLS files.

Find your spreadsheet information in a flash!

From everyday tasks to complex projects, Spreadsheet Notebooks are the easiest way to work with your spreadsheets. By incorporating multiple spreadsheet pages in a single file (one notebook can handle



up to 256 spreadsheet pages), you can break any complex spreadsheet into easy-to-manage pieces.

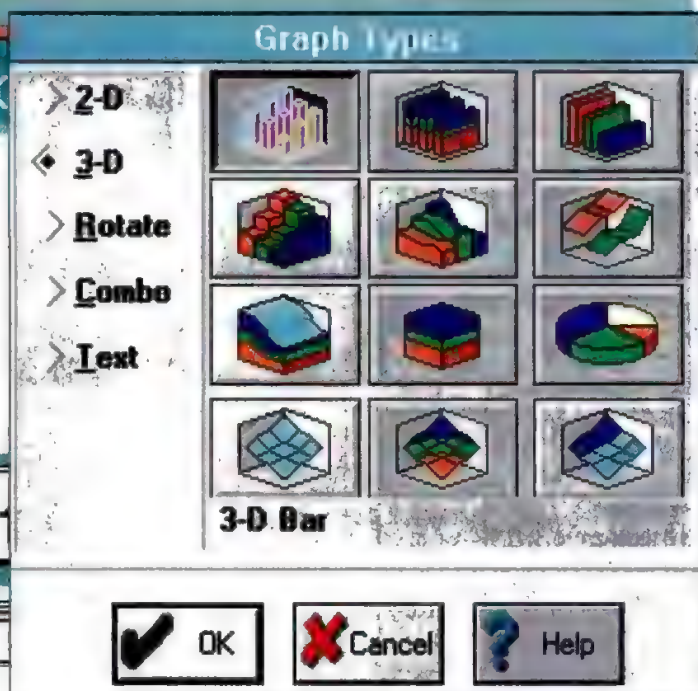
Assign meaningful names to your notebook tabs and finding information is as easy as flipping through a notebook.

Notebooks are the smart way to do 3-D spreadsheets! You can present data in flip-chart style and format pages in a group, like chapters. Because you navigate easily, it's simple to build multi-page models.

Totals	7.1	4.6	6.5	10.2	28.4
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Qtr 1	
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	2.8

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Notebooks

You may never open the manual

Quattro Pro for Windows is the most usable spreadsheet ever. With Quattro Pro for Windows' object-oriented user interface, every action you take is easier and faster.



Object Inspector menus let you make one-step changes to any object on your screen with just a click of the *right* mouse button—no more searching through layers of pull-down menus.

Context-sensitive, customizable **SpeedBars™** give you pushbutton access to your frequently used commands. **Drag and Drop** lets you move or copy data instantly with the mouse.

Built-in graphics rival standalone packages

Quattro Pro for Windows gives you extraordinarily powerful graphics tools *built-in*. You'll never have to learn a separate graphics package.

Get 35 2-D and 3-D graph types—with thousands of variations. Then enhance your graphs by adding text, lines, arrows, and built-in clip art.

Use the **Slide Show** and **Light Table** to create incredible electronic presentations. Arrange and rearrange slide shows in seconds and customize them with dazzling transition effects.

You can create 35mm slides and overheads, too. No other spreadsheet gives you all this presentation power.

*Quattro Pro for Windows and Spreadsheet Notebooks have patents pending.

Notebooks

Object Inspector

Database Access

1-2-3 Compatibility

Windows Offer

Quattro Pro beats

Other spreadsheets don't compare

FEATURE	QPW	EXCEL 4.0	1-2-3/W R1.1	1-2-3 R2.4	1-2-3 R3.1
ORGANIZATION					
Spreadsheet Notebooks	Y	N	N	N	N
Nameable Tabs	Y	N	N	N	N
Group Formatting on Selected Pages	Y	Y	N	N	N
True 3-D Consolidation	Y	N	Y	N	Y
EASE OF USE					
Right Mouse Button Formatting	Y	Y	N	N	N
Object Inspectors	Y	N	N	N	N
Context-sensitive SpeedBars	Y	Y	Y	N	N
SpeedFill and SpeedFormat	Y	Y	Y*	N	N
Drag and Drop	Y	Y	N	N	N
GRAPHICS AND PRESENTATIONS					
3-D Graphs	Y	Y	N	N	N
Slide Show with Light Table	Y	N	N	N	N
Live Linked Graph Types and Formatting in Slide Shows	Y	N	N	N	N
DATABASE ACCESS					
Live View of Networked Database Tables	Y	N	N	N	N
Database Desktop	Y	N	N	N	N
CUSTOMIZATION					
Macro Buttons on Spreadsheet	Y	Y	N	N	N
Visual User Interface Builder	Y	N	N	N	N
COMPATIBILITY					
Reads Quattro Pro, Excel, 1-2-3 Files and Styles (including Allways & Impress)	Y	N	N	N	N
Runs Your QPro & 1-2-3 Macros†	Y	N	N	N	N
ANALYSIS					
Optimizer	Y	Y	Y	N	Y

*Requires add-in.

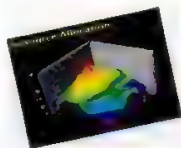
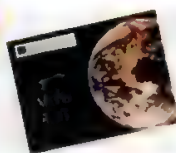
†Some 1-2-3 macros may require modification.

Outstanding 1-2-3 and Excel compatibility

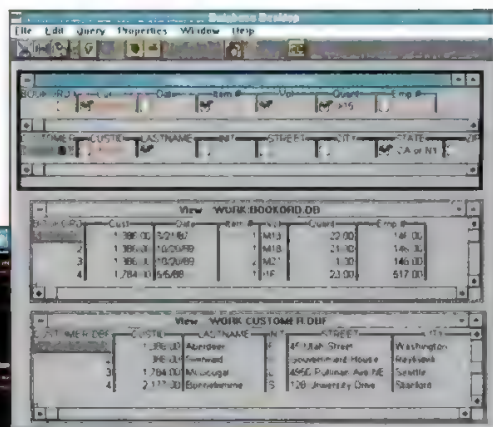
Quattro Pro for Windows is the next-generation Windows spreadsheet. It is the *only* spreadsheet that gives you both innovation *and* compatibility with Lotus 1-2-3, Excel, and Quattro Pro. Quattro Pro for Windows supports 1-2-3 files, macros, and publishing styles, including Allways, Impress, and WYSIWYG. It also supports Excel .XLS 3.0 and 4.0 files. What's more, Quattro Pro for Windows is much more compatible with 1-2-3 than Excel. For example, unlike Excel, Quattro Pro formulas, ranges, and command actions (like moving blocks) work as 1-2-3 users would expect.

Fast database access to dBASE and Paradox

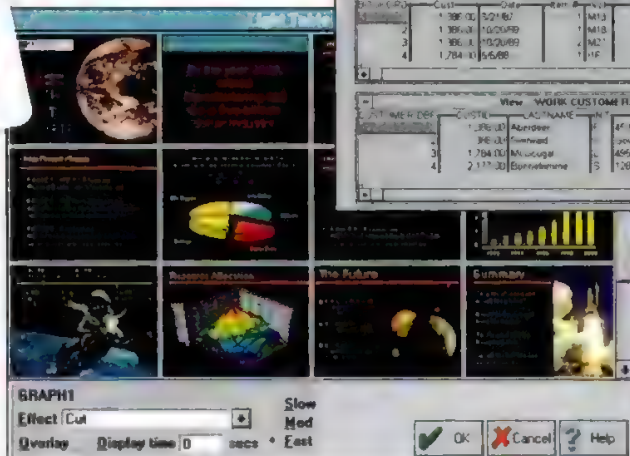
Only Quattro Pro for Windows gives you easy access to database information. Borland's unique Database Desktop™ lets you view, edit, and copy dBASE and Paradox tables *directly* from within Quattro Pro. And *only* Quattro Pro for



Only Quattro Pro for Windows gives you a Light Table to arrange your electronic slide shows in seconds.



▲ The Database Desktop: *Only* Borland makes access to dBASE and Paradox data this easy with QBE.



1-2-3 and Excel!

Windows has Query By Example, so you can ask questions about your data with point-and-click ease. Since it's from Borland, the database leader, you can count on it working right even in network environments.

Create custom applications in minutes

Because of its object-oriented design, *only* Quattro Pro for Windows makes it easy to customize your spreadsheet. All the tools are there for you to create your own custom dialog boxes, powerful time-saving macros, and SpeedBars.

Don't settle for second best

Get the spreadsheet from the company that J.D. Power and Associates ranked #1 (tied with WordPerfect) in Customer Satisfaction Among Business Users.* Get Borland's Quattro Pro for Windows today!



Quattro Pro for Windows and DOS now together for the price of one!

Imagine! Getting the world's best Windows spreadsheet and best DOS spreadsheet for the price you'd ordinarily pay for just one. We call it WinDOS, an unprecedented offer that makes the transition from DOS to Windows fast, easy, and painless.

Buy Quattro Pro WinDOS because it's the hands-down best Windows spreadsheet, and get the top DOS spreadsheet FREE! Or buy Quattro Pro WinDOS because it's the absolute best DOS spreadsheet, and move to Windows at your own pace—your Windows spreadsheet is already bought and paid for.

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QUATTRO PRO

FOR WINDOWS

FOR DOS



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QUATTRO PRO 4.0 FOR DOS
BORLAND

"Quattro Pro for Windows is [what] Lotus should have released, but didn't."

InfoWorld

"Quattro Pro 4.0 [is] the ultimate DOS spreadsheet."

PC Magazine



B O R L A N D

Software Craftsmanship

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CIRCLE 287 ON READER SERVICE CARD

Notebooks

Object Inspector

Database Access

1-2-3 Compatibility

Windows Offer

■ Networking

LANalyzer for NetWare Takes Snapshot of Network Performance

BY M. KEITH THOMPSON

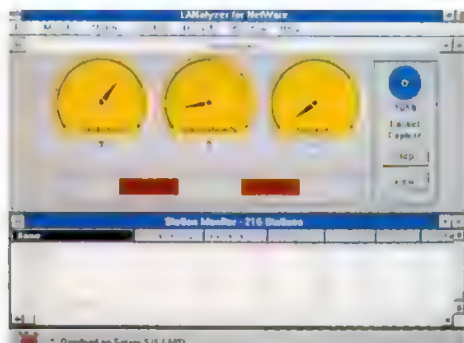
An advanced network protocol analyzer can cost upwards of \$10,000 and work only for those schooled in its arcane ways. Novell's LANalyzer for NetWare (\$1,495) is an easy-to-use Windows-based program that provides a snapshot of network operation and captures network packets for protocol analysis. It decodes all seven layers of NetWare and Apple protocols, monitors a network on a day-to-day basis, reports long-term network trends, and analyzes specific problems for the careful LAN manager.

LANalyzer for NetWare is designed for ease of use: You can install the software and begin studying your network's performance in just 10 minutes. Unlike other analyzers, LANalyzer lets you use and analyze the network simultaneously. For a quick glance at the overall status, the Dashboard displays three speedometer-type dials—for packets per second, network bandwidth utilization, and errors per second—in an easy-to-read graphical format.

In addition to these immediate statistics, it creates graphs, both short-term (the most recent 15 minutes) and long-term (the entire time LANalyzer has been running), that give you the details on packets and errors per second as well as percentage of bandwidth and kilobytes per second, all over time.

PACKET CAPTURING

LANalyzer captures all the packets on the network, or only the packets meeting your criteria, and stores them in a buffer that you can view or print. After you select a packet, the program highlights the data in that packet for analysis.



DASHBOARD: Three dials display data on current network traffic.

The Station Monitor window displays packet statistics, including station address, packets in and out, errors, kilobytes in and

out, and packets and kilobytes per second. Multiple resizable windows let you view the beginning, middle, and end of the captured packets simultaneously, a useful feature.

Though powerful, LANalyzer for NetWare could use some improvement. It tracks station names but does not display them in a user-definable table. Thus, computers connected but not logged in and remote print servers like the QMS-PS 1700 are not added to the list of names. Also, in situations where several people use one computer, the system administrator needs a name for the computer to determine

where traffic is coming from.

The program is also missing a flexible triggering mechanism to start and stop capturing packets. The trigger is based on a network or server alarm and not, for instance, on a certain computer starting a print job.

A valuable troubleshooting tool, LANalyzer for NetWare combines detailed network analysis with ease of use. It's a must-have product for all NetWare network managers who want to have a detailed look at the traffic moving on their LANs.

• **List price:** LANalyzer for NetWare, \$1,495. Requires: 3MB RAM, 5MB hard disk space, Windows 3.0 or later, Ethernet card with ODI driver that supports promiscuous mode. Novell Inc., 122 East 1700 South, Provo, UT 84606; 800-638-9273, 801-429-7000.

Circle 419 on reader service card

■ Financial Software

\$99 MultiCalc Handles Wide Range of Financial Tasks

BY MIKE FALKNER

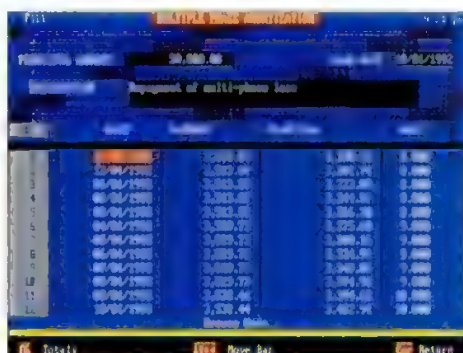
Ready to mothball your HP calculator and retire your Lotus 1-2-3 add-ins? MultiCalc is designed for those who spend their day working with loans, reviewing leases, and analyzing financial information. It brings refreshing flexibility and simplicity to tedious and often cumbersome tasks.

MultiCalc easily handles the needs of the mortgage broker, calculating payments for traditional loans as well as adjustable rates, balloon payments, and interest-only loans. It can print the full amortization schedule or yearly totals, and, to stay within the law, it will throw the Reg "Z" APR calculation at the end of the report.

To handle more creative financing, you can use MultiCalc's multiple-phase amortiza-

tion to change the interest rates, payment terms, and other parameters of the loan throughout the payoff period.

If you service loans, MultiCalc generates payment books



LOAN SHARP: MultiCalc's amortization handles changing rates and payments.

and allows you to post payments to a loan schedule. It uses grace periods to calculate late fees, and you can generate late notices for loan customers.

If you're a financial adviser, MultiCalc gives you many of the

financial functions that are available in 1-2-3—present value, future value, and internal rate of return—and some that aren't, including the modified IRR and modified NPV.

MultiCalc also includes some handy statistical functions for calculating mean, variance, standard deviation, and both linear and multiple regressions. You enter information much as you would in a spreadsheet, and the results are displayed on the screen.

Though the interface is inconsistent in some of the more complicated screens (like the amortization), and the help function is disappointing, MultiCalc is a powerful collection of business tools. No matter which financial hat you wear, the \$99 price is a bargain.

• **List price:** MultiCalc, Version 2.0, \$99 (\$149 after 12/31/92). Requires: 640K RAM, DOS 2.0 or later. PC Works Inc., 801 Madrid St., #105, Coral Gables, FL 33134; 800-262-6890, 305-444-6040; fax, 305-444-5413.

Circle 420 on reader service card

■ Windows Utilities

WinMaster Scopes Out System Info, Launches Programs

BY BARRY SIMON

Keeping your hard disk organized and in top form can improve Windows performance, and WinMaster can help you do it. Known for its DOS-based disk utilities, PC-Kwik Corp. (formerly Multisoft) has entered the crowded Windows utility market with this \$129.95 collection of disk utilities and application launch tools. Specially marked packages of WinMaster include Version 5.0 of the Super PC-Kwik disk cache and RAM disk.

WinMaster installs four main icons in the WinMaster Program Group: WinMaster Toolbox, Storage Vault, Kwik-Info, and Power Disk. The toolbox maker does not offer the powerful scripting abilities of hDC Power Launcher and Synapp's Synergy, but makes up for the gap with the simplest, most elegant user interface

we've ever seen in a launcher.

You can create as many toolboxes as you like, configure them to float on top of other applications or to pop-up via hotkey, and customize the launch buttons with a launch command and an icon, though not with a startup directory distinct from the program directory. Adding programs to the toolbox is simply a matter of dragging and dropping files from the File Manager (which works only with Windows 3.1), importing whole groups from Program Manager, or entering programs manually. With a few button clicks, you can rearrange the toolbox in a single column, double columns, a single row, or multiple rows.

In the WinMaster Toolbox, you'll find seven buttons for launching miniapps that run, find, copy, delete, and rename files, and exit and restart Windows. Each function is simple but well thought out. For example, the file finder allows you to paste the requested file into the Clipboard.

Another convenient utility is KwikVault, which you use to compress and store files in PKZIP format by dragging and dropping.

QUICK SYSTEM INFO

Another group of utilities accessed from the KwikInfo icon is represented by 12 buttons—5 that launch meters for monitoring system status and 7 that provide information. The meters display details on CPU, RAM, system resource, and disk usage, and a control/monitoring program handles the Super PC-Kwik cache (similar to the SmartDrive control program in

the Windows Resource Kit).

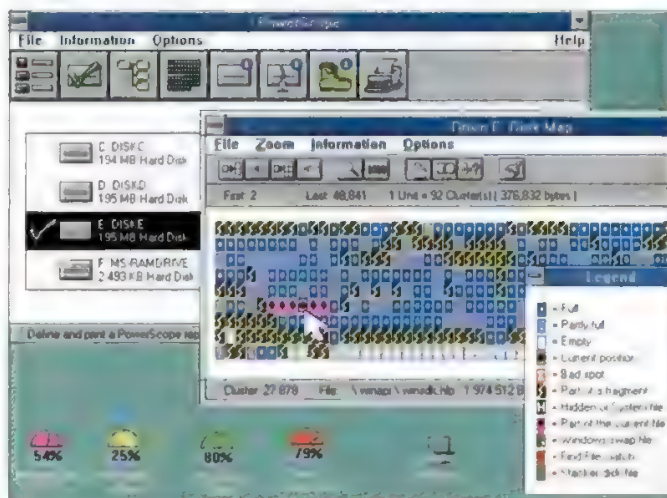
Though the information modules are not as thorough at the system level as QA Plus, System Sleuth for Windows, or The Norton Desktop for Windows' SysInfo, they do have a few unique features as well as a dynamite disk reporter. The program reports basic information about RAM, display, printer, system, and fonts, and a task information window displays memory usage by task.

POWERSCOPE DISK VIEWER

Without a doubt, the star of the informational modules is PowerScope, a disk reporter that goes way beyond basic disk

information when you go to another partition. On our test system, PowerScope's file-find was glacial. This could be attributed to the SCSI driver on the test system along with some unfortunate choices PC-Kwik has made in the way PowerScope accesses the disk. And too often, PowerScope prevents you from running time-consuming operations in the background.

PowerScope can also display a detailed report on the fragmentation level of your disk, a feature that dovetails with WinMaster's two defragmentation tools. Power Disk is a well-built, slick defragger able to handle large disks with aplomb.



METER MADE: WinMaster's modules include a variety of performance meters and a graphical disk map.

space and boot information to provide the most thorough look at disk usage of any DOS or Windows program we've seen.

PowerScope displays usage in a bar chart, on either a directory-by-directory basis or by total subdirectory usage. But its most spectacular component is DiskMap, a graphical picture of the clusters on your disk with indications of fragmented files, bad clusters, and hidden files. To find what file is associated with a given cluster, just click on it. An inverse file-find highlights the clusters associated with a file.

Though a unique component, PowerScope is still a little rough around the edges. It reads but does not store partition in-

Look for the free PC-Kwik cache included with some packages. We checked street prices with four mail-order companies and found packages without cache priced at \$49; with cache at \$7 to \$9 more. Don't be surprised to find even more complicated pricing structures. Dustin Software was offering the program without cache for only \$29 if purchased with another Windows product, and Egghead Software was offering the same package for \$19 if purchased with a Windows application from Microsoft.

At any price, WinMaster is an attractive collection of utilities that will help you gain control of the Windows environment. □

FACT FILE

WinMaster, Version 1.0

PC-Kwik Corp., 15100 S.W. Koll Pkwy., Beaverton, OR 97006; 800-284-5945, 503-520-4299; fax, 503-646-8267

List price: \$129.95.

Requires: 2MB RAM. (2MB of extended memory recommended), 4MB hard disk space, Microsoft Windows 3.0 or later

In short: WinMaster packs a powerful set of unique disk and launch utilities behind the best interface in the Windows launcher market. It includes a customizable launch toolbar, memory and disk reports, and a disk defragger

422 ON READER SERVICE CARD

Borland's Why it's smart

The #1-selling database

dBASE® is the #1-selling relational database in the world. It offers the most complete set of tools for developers and users to access and manage their corporate data.

Today, more than three million people use it to build applications that help them run their businesses and maintain a competitive edge. And with the world's largest community of trainers, consultants, and add-on software extensions, it's little wonder that dBASE is the standard for corporate applications development. Now, new dBASE IV version 1.5 makes it smarter than ever to go with #1.

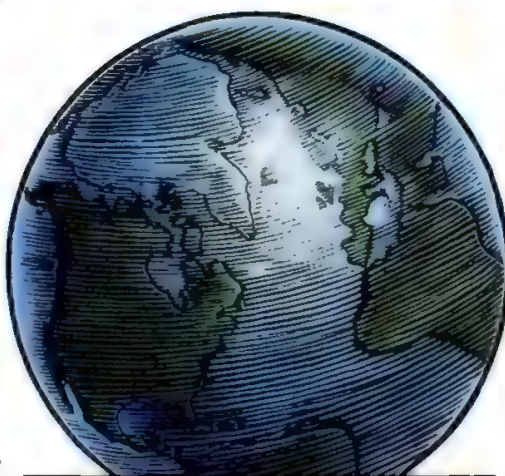
New! Version 1.5 is here

Now there's an easier-to-use, faster, and more powerful dBASE. It's packed with the features you've asked for most, making it smarter than ever to use the world's #1 PC database.

Working smarter is faster



With new dBASE IV, you get the job done faster because you work smarter. Smarter because new IQ!™ optimization technology



The Worldwide Standard

What's new in dBASE IV v1.5:

For Users

- Mouse support
- Editable multi-file view
- Calculated field linking
- QBE summary operators and pick lists
- Automatic install
- New optimization technology—IQ!
- Save query indexes

For Developers

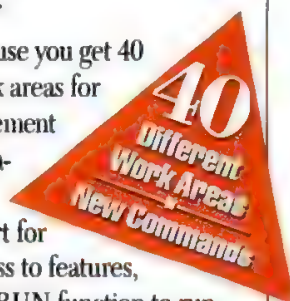
- INDEX functions
- 40 work areas
- Template Language included
- Enhanced BLANK support
- Browse/Edit organize menu toggle
- Conditional compilation
- Low-level file I/O
- Open architecture Control Center
- Enhanced RUN function
- Multiple and global procedure libraries

automatically selects the fastest method to retrieve your data. Smarter because you can create tables, forms, reports, queries, and menus in record time—without programming.

Smarter because you get 40 different work areas for easier management of large applications. Plus mouse support for fingertip access to features, an enhanced RUN function to run popular DOS applications from within dBASE, and comprehensive multi-user capabilities. All of which means you maintain tight data integrity, more flexibility and more support than ever before.

Advanced design tools build applications faster

dBASE IV's easy-to-use Control Center comes complete with an innovative set of design tools, including report, form, and label generators that help you create your applications quicker. And the Control Center's open architecture makes it easy to enhance or customize your own applications by incorporating third-party add-on products available for dBASE.



dBASE IV[®]

er to go with #1

Faster applications development

The industry-standard dBASE language comes with a host of improvements that speed development:

- Integrated debugger and a built-in applications generator
- More than 40 new commands, functions, and keywords—Template Language now included
- C language—like low-level file I/O
- IBM® SAA-compliant SQL
- Advanced BLANK support

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Now that it's from Borland, your investment in dBASE is secure. dBASE gives you all the benefits of complete compatibility and application portability that come with the database standard. And Borland is the acknowledged database technology innovator, so you're on the winning team for the long haul. Get dBASE IV v1.5 today. You'll see why it's smarter than ever to go with #1.



Get **NEW dBASE IV v1.5** today and receive more than \$250 in additional software,



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Purchase dBASE IV v1.5 and Borland will give you Central Point Software's Backup and Anti-Virus programs free.* That's a suggested retail value of \$258. Offer good while supplies last.

Check DOS disk size required: ☐ 5 1/4" ☐ 3 1/2"

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Company: _____

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COMPLETE this coupon. ATTACH a copy of your sales receipt (or a copy of purchase order and billing invoice) AND ENCLOSE \$9.00 U.S. for shipping and handling (check or money order payable to Borland International, Inc.).

Send to: Borland's Pro Pack Offer, P.O. Box 7243, San Francisco, California 94120-7243.

*Offer good in U.S. and Canada only on dBASE IV v1.5 purchases. Offer good while supplies last. Only original coupons will be accepted. No responsibility is assumed for lost, late, misdirected, or destroyed mail. Please allow 4-6 weeks for delivery. Subject to all local, state, and federal regulations. Void where prohibited. Offer not valid for Upgrades, Competitive Upgrades, LAN Packs, Volume Packs, or any other Borland promotion except dBASE IV v1.5 products. Distributors and resellers not eligible to participate. Central Point is a registered trademark of Central Point Software.

B O R L A N D

dBASE IV from Ashton-Tate®, a Borland Company

CIRCLE 285 ON READER SERVICE CARD

Multimedia

HSC InterActive Lowers Cost Of Desktop Presentations

BY ROBERT KENDALL

AimTech's IconAuthor helped simplify multimedia authoring under Windows with its accessible interface. But its \$4,995 price tag wasn't so accessible. Now HSC Software is offering a scaled-down version of the package, called HSC InterActive, for a more affordable \$495.

HSC InterActive forgoes the powerful variable handling, database functions, and advanced support for motion video that make IconAuthor so attractive for computer-based training. Aimed more at the presentation market, it has a well-balanced set of screen show and multimedia features.

DRAG-AND-DROP MULTIMEDIA

HSC InterActive replicates IconAuthor's flowchart approach to designing applications and presentations. This makes laying out branching structures easier than with comparably priced multimedia packages. A strip of icons representing each type of event you can place in a presentation runs down the left side of the screen. You build a presentation by dragging and dropping icons into your workspace, where the program connects them with flowchart lines.

There are a variety of events you can select: displaying graphics files with transition effects, playing sound files, running animations, and presenting menus. You can even add your own icons by customizing or combining existing icons. Once you've placed an icon in your flowchart, you double-click on it to add parameters—the name of the graphics or audio file, the transition effect, and so on.

The flowchart view, along with the aid of a multilevel

zoom, lets you take in the grand scheme of your presentation at a glance. You can collapse any group of related icons into a single icon to improve readability. Another big benefit of the flowchart is that it's very easy to reorganize complex structures by just dragging and dropping groups of icons to new locations.

HSC InterActive is very flexible in displaying graphics and applying transition effects. It handles files in .BMP, .PCC, .PCX, .RLE, and .WMF

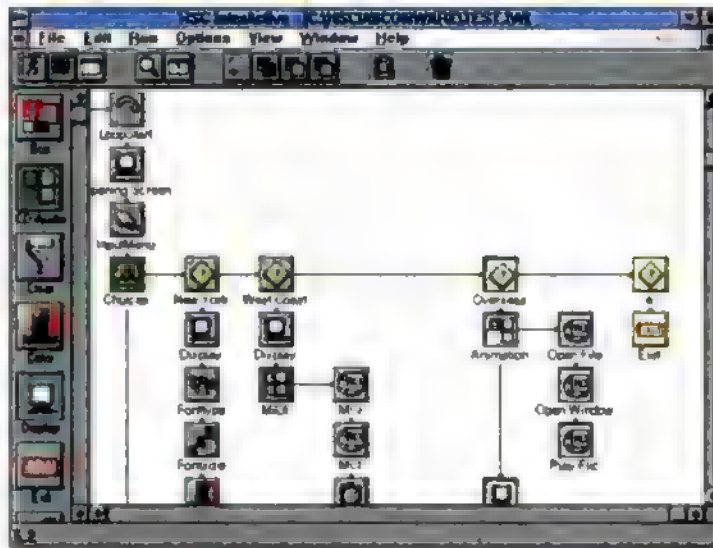
formats in any resolution and in up to 32,768 col-

ors. When it comes to graphics editing, though, it's quite limited.

The separate graphics editor makes use of only 10 fonts. You can edit 256-color files using only 20 of those colors and some dithering patterns. And since you have no control over palettes, there's no way to reconcile conflicting palettes of different

graphics in a single presentation. On the positive side, there's a nice feature for effortlessly creating 3-D push buttons for menus.

You must turn to the RezSolution module for resizing, cropping, or skewing graphics.



CONNECT THE ICONS: You build a presentation by dragging icons to a flowchart.

Using RezSolution you can change resolutions, turn colors to black-and-white dithered patterns, and capture screens from other programs.

One set of HSC InterActive's icons lets you overlay text on-screen without having to create a graphics file, though you're limited to only 20 fonts. Just type in a line of text and position it—you can even rotate the text. This can save time and disk space when you want to add labels or display prompts.

SIMPLE ANIMATION MODULE

You create animations in a separate program called IconAnimate. You can do little more than clip sprites from a graphics file and move them along a straight or a freehand path. Though you cannot create multi-cel animations or move several sprites at once, you can move sprites behind other objects. IconAnimate's interface can be rather confusing, however, and is annoyingly inconsis-

tent with the main program.

During installation, the program installs Autodesk's Media Control Interface (MCI) driver, which lets you play Autodesk Animator .FLI and .FLC animation files within a presentation. A motion video icon lets you control video-in-a-window boards such as Creative Labs' Video Blaster and the True-Vision Bravado, and there's even an icon for controlling playback and cuing on Pioneer laserdisk players. Using an MCI icon, you can directly send MCI command strings which will let you control any devices that supply MCI drivers, such as the mixer on MediaVision's Pro AudioSpectrum sound board and some Sony VCRs.

As in IconAuthor, working with sound files is awkward and can be confusing. There are separate icons for MIDI, .WAV audio, and CD audio, but unfortunately, these merely contain several MCI command strings that you must edit manually. For example, you must type in the path and filename of the audio file after you've loaded the Windows File Manager in order to find the file you want.

Interactive branching is the program's forte. It's easy to construct menus and assign branching conditions based on mouse or keyboard input. The program highlights different menu options when a user moves the cursor over them, and you can specify a time-out for each menu to keep a self-running demo rolling.

The program comes with a selection of MIDI music files and .WAV sound files as well as some attractive 256-color backgrounds. There's also a runtime version of the program so you can distribute completed presentations.

Though no match for the animation capabilities of Gold Disk's Animation Works Interactive or MacroMind's Action, HSC InterActive does offer a well-rounded set of multimedia features and a uniquely easy method for organizing presentations. □

FACT FILE HSC InterActive, Version 1.0 HSC Software, 1661 Lincoln Blvd., #101, Santa Monica, CA 90404; 310-392-8441 List price: \$495. Requires: 1MB RAM (2MB recommended), Windows 3.0 or later. In short: HSC InterActive provides a wide range of multimedia features, though it's weak on animation and graphics editing. Its flowchart approach makes reorganizing presentations easy. 421 ON READER SERVICE CARD
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New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

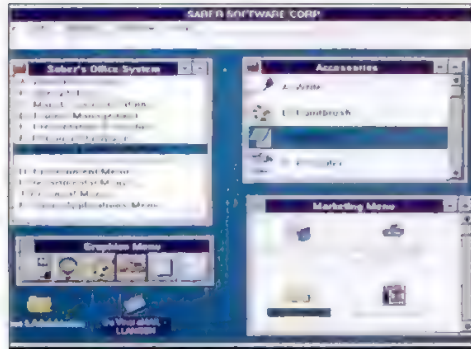
By Emerson Andrew Torgan

IMPROVED

Saber Menu System Puts the LAN Administrator in Control

Saber Software's Windows front end, **Saber Menu System for Windows, Version 2.0**, gives LAN administrators control over workstation access to programs and files while letting you customize your individual desktop. The update provides networkwide control and management of users' .INI files via the company's INIMAN utility.

When you log on to a network, the INIMAN utility makes the necessary hardware, network, or installation-specific changes to your .INI files without altering personal or default settings. From then on, when you log on to the network



Saber Menu loads your personal menu.

at any workstation, Windows loads with your preferences regardless of the workstation's hardware configuration. **Saber Menu System for Windows** also provides control over network menus, item configuration, and .PIF configuration. You can create customizable views, personalized menus, and you can access password security, screen blanking, and network messaging capabilities. Applications can be moved from the network menu to a personal menu via drag-and-drop.

A replacement for the Windows Program Manager, **Saber Menu System for Windows, Version 2.0**, allows you to style your personal menu in one of four ways: a Windows-style icon list, an OS/2-style combination of icons and text, text listings, or an icon palette.

•List price: *Saber Menu System for Windows, Version 2.0, single-user version*, \$89; *ten-user version*, \$349. **Saber Software Corp.**, P.O. Box 9088, Dallas, TX 75209; 800-338-8754; 214-361-8086; fax, 214-361-1882.

Circle 402 on reader service card

HOT PROSPECT



Creative Labs Debuts Trio of New Blasters

Sound is serious business at **Creative Labs**. **Sound Blaster 16**, a 16-bit sound card, includes a stereo digital/analog mixer for all audio sources and features a stereo music synthesizer that uses enhanced 4-operator FM technology with 20 voices. It's Windows 3.1-compatible and has a built-in 4-watt-per-channel amplifier; volume, bass, and treble controls; microphone and stereo line-in jacks; and a MIDI interface.

MIDI Blaster is an external device that meets the general MIDI specification and provides PCM wave-sampled instrument sounds with 20-instrument polyphony and presets that feature 128 sounds, 33 effects, and 55 drums.

Port Blaster is designed to provide sound on-the-road for the portable PC user. The unit, which attaches to the parallel port of any portable or desktop PC, features enhanced 4-operator, 20-voice stereo FM synthesis, stereo 8-bit voice sampling and playback, a stereo digital/analog mixer for all audio sources, a built-in amplifier and speaker, and a MIDI interface.

•List price: *Sound Blaster 16*, \$349; *MIDI Blaster*, \$499; *Port Blaster*, \$199. **Creative Labs Inc.**, 1901 McCarthy Blvd., Milpitas, CA 95035; 800-998-5227, 408-428-6600; fax, 408-428-6611.

Circle 401 on reader service card

NEW

Create Multimedia Presentations In Minutes

With **Asymetrix's** \$89 **Multimedia Make Your Point, Version 1.0**, you can combine sound, text and graphics from a single dialog box to create a multimedia presentation under Windows 3.1. The product, an update to the company's **Make Your Point** application, ships with more than 30 templates and 80 wave, MIDI, graphics, and animation clips. Templates can be modified and saved to a gallery, and transition effects such as wipe, dissolve, and zoom can be applied to presentations. A sound card is required to access the MIDI and wave audio. Systems with a CD-ROM can access CD audio and incorporate it into presentations.

MediaBlitz!, Version 1.0, is a multimedia utility designed to get multimedia novices up and running in minutes. It supports CD audio, waveform audio, MIDI, animation, and Windows bitmaps. The utility consists of three applications: **Clipmaker**, which helps you create and store multimedia clips; **ScoreMaker**, which helps you arrange clips, such as audio, animations, and bitmaps, along a time line; and **ScorePlayer**, the utility's playback-only application, which plays the scores.

•List price: *Multimedia Make Your Point, Version 1.0*, \$89; *MediaBlitz!, Version 1.0*, \$95. **Asymetrix Corp.**, 110 110th Ave. NE, #717, Bellevue, WA 98004; 800-448-6543, 206-462-0501; fax, 206-455-3071.

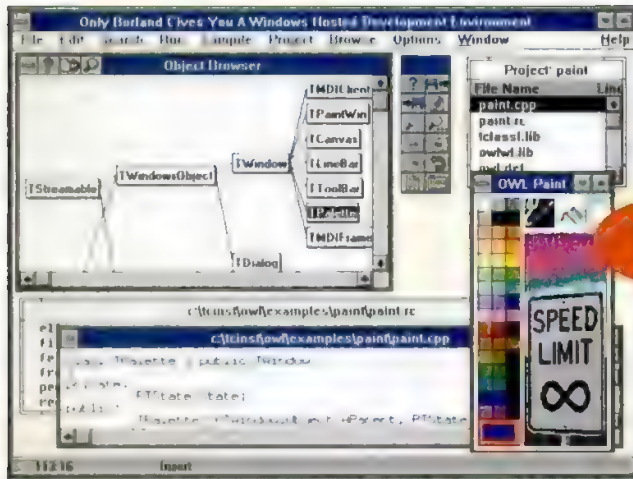
Circle 403 on reader service card

NEW

Full-Motion Compression from New Media Graphics

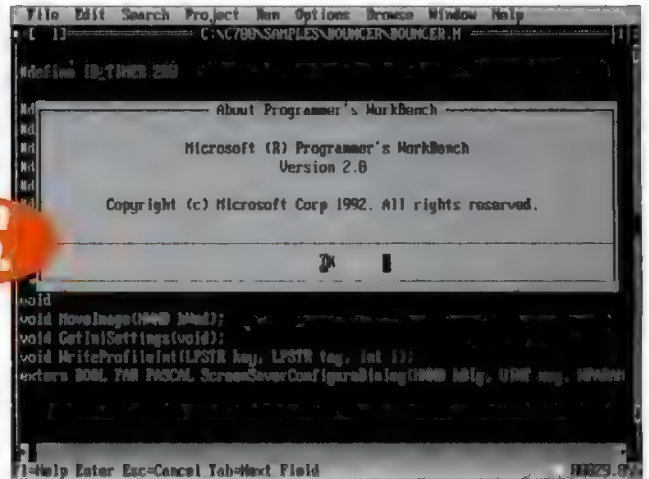
New Media Graphics has unveiled the **Super Motion Compression** card, a real-time, full-motion video and stereo audio compression and decompression card for ISA-based PCs. The card uses the JPEG algorithm to store video motion clips and audio to a hard disk, and plays the compressed clips back from the same disk or a CD-ROM. The card can store video clips at an average disk-storage rate of 10MB per minute of source material, according to the company. The JPEG chip set allows compression and decompression of video at 30 frames per second. The **Super Motion Compression**

BORLAND C++ DOES



Borland C++ & Application Frameworks

Streamline your development cycle by creating Windows applications within the graphical Windows environment.



Microsoft C/C++

Why write a Windows application using character-mode DOS?
It doesn't make sense.

Real programmers speak out on Borland C++ vs. Microsoft C/C++

"My level of productivity with Borland's products is way beyond what I get out of Microsoft's products."
—Larry Skinner, Kingsport, TN

"Borland® C++ is a superior development tool. The integrated development environment is programmer intuitive and developer friendly. . . . Borland just plain offers developers more options and better quality."
—Thomas Joux, Minneapolis, MN

"When I installed the program [Microsoft C/C++], it corrupted my Windows program manager and it took me five hours to get it working again. I then realized I had made a mistake. I just cannot believe that the people who invented Windows would have a development program that does not run in Windows."
—Barry Bowen, Memphis, TN

"We bought it [Microsoft C/C++] because of the low price but we gave up on it after two weeks of frustration."
—Jeffrey Kho, Fremont, CA

"Our Windows development team is trying to gear up for our move from C to C++. Borland's third-generation C++ compiler gives us a lot more confidence to make the move to C++ than the first-generation C++ attempt from Microsoft."
—John Ferguson, Springdale, AR

"The Programmer's Workbench (PWB) in Microsoft® C/C++ is a cruel joke. I can't believe that Microsoft has the gall to tout 7.0 as a wonderful Windows development environment when the PWB proves that they can't manage to write a decent development environment."
—Roy Sproul, Seattle, WA

"There's no support for OS/2® [in Microsoft C/C++] even planned, and the default install on my system failed to compile the example programs!"
—Steven C. Stambach, Fresno, CA

"After using both Microsoft and Borland products throughout the years, I am convinced that Borland has . . . the best value for the customer."
—Mark Cooperstein, Kingsport, TN

"PWB (Programmers Workbench), CodeView—the entire development environment is pathetic! MS-C7 cannot install from an alternative drive. CodeView does not run in standard mode. Bottom line is that it [Microsoft C/C++] is frustrating every step of the way."
—Arthur Applegate, Redmond, WA

"The Microsoft Foundation Classes (MFC) is difficult to use if you are new to Windows. The compile times are slower than C 6.0. And the most aggravating thing was that MS charged me extra for the SDK documentation."
—Larry Skinner, Kingsport, TN

"Borland's consistent quality makes it easy to use and recommend their products. This level of quality is a target we strive for in the products we produce. Our tool has become our goal!"
—Scott Wallace, Oklahoma City, OK

WINDOWS BETTER!

REPORT CARD		
AUGUST 17, 1992		
C++ Windows development		
	Borland C++ & Application Frameworks version 3.1	Microsoft C/C++ version 7.0
List price	\$749	\$495
Performance		
Programming environment	Excellent	Good
Language	Very good	Good
Productivity	Excellent	Good
Documentation	Very good	Excellent
Ease of learning	Very good	Good
Ease of use	Excellent	Good
Support		
Support policies	Excellent	Very good
Technical support	Very good	Very good
Value	Excellent	Very good
Final scores	8.9	6.9

These programmers have learned that the best tools for Windows don't come from the company that makes the operating system. They come from the company that makes the best Windows and DOS compilers—Borland.

With Borland® C++ you get a complete Integrated Development Environment (IDE) for Windows and DOS. Your development cycle is streamlined because you can create, edit, and run your Windows applications all from within a graphical Windows environment.

You'll love the convenience and power of the IDE, with its special features like the ObjectBrowser™ to show you class relationships and help you navigate through your code, and the special SpeedBar™ for instant access to commonly used functions.

Integrated Resource Workshop **VS.** disintegrated SDK

With Borland's Resource Workshop you can create Windows resources quickly and easily. You just "draw" great-looking Windows resources like dialog boxes, buttons, icons, and more. It's infinitely simpler than wrestling with the SDK.

Write less code **VS.** write more code

Borland's Application Frameworks™ let you "bolt on" a complete user interface with just a few lines of code. Our ObjectWindows™ high-level objects give you graphical user interfaces with far less code than the low-level Microsoft Foundation Classes. And Turbo Vision™ gives you great ready-to-plug-in user interfaces in character mode for DOS.

Powerful tools **VS.** wimpy tools

Borland C++ gives you a complete selection of the finest tools. Turbo Debugger® for Windows and DOS debugs code fast. Turbo Profiler™ pinpoints bottlenecks in your code. WinSight™ helps monitor Windows activity. And you also get object-oriented Turbo Assembler® and more than 4,500 pages of clear, comprehensive documentation.

Full C++ **VS.** partial implementation

Full language compliance is key in a compiler and only Borland complies with AT&T's CFRONT 3.0 C++ standard. Only Borland gives you templates so you can create reusable code for the container classes and other parameterized types.

Third-generation **VS.** first attempt

Borland's third-generation C/C++ compiler brings you the power and reliability that only comes with experience. Borland gives you a faster C/C++ compiler with great features like a smart project manager and automatic, safe precompiled headers. Just some of the many reasons why we've sold more than 700,000 C/C++ development systems to professionals worldwide.

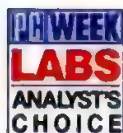
Go with the best

The best C and C++ tools for Windows are from the leader in Object-Oriented Programming. Trust your code to Borland. See your dealer today, or

call 1-800-331-0877, ext. 5380.

In Canada, call 1-800-461-3327.

Call now and we'll send you a free technical white paper revealing the honest comparison of Microsoft C/C++ and Borland C++.



June 10, 1991
Borland C++



July 1992
Borland C++ & Application Frameworks 3.0



February 3, 1992
Borland C++ Windows Development



December 23/30, 1991
Borland C++



January 1992
Borland C++



March 23, 1992
Borland C++



B O R L A N D
The Leader in Object-Oriented Programming

New & Improved

card supports Microsoft's DV-MCI development environment.

Also new from the company is the Super Encoder board, which converts VGA output from a PC to broadcast-quality video for VCRs and TVs. When used with the company's Super VideoWindows ISA board, the Super Encoder lets users create full-motion video presentations from a number of sources, modify them on a PC, and record them to videotape. The unit offers programmable hue settings and on-board lookup tables for VGA palette mapping and gamma correction. The Super Encoder Board provides two modes of operation: direct digital mode and 24-bit RGB mode. The direct digital mode accepts digital VGA directly from the VGA card connector and utilizes the lookup tables for shadowing the normal VGA palette. In 24-bit RGB mode, the Super Encoder digitizes analog VGA to 24 bits per pixel.

•List price: *Super Motion Compression Card*, \$1,995; *Super Encoder Board*, \$595. *NewMedia Graphics Corp.*, 780 Boston Rd., Billerica, MA 01821; 800-288-2207, 508-663-0666; fax, 508-663-6678.

Circle 404 on reader service card

NEW

Kansai Debuts Line of High-Speed Printer Buffers

Kansai Electric is shipping its line of EDB printer buffers, which let multiple users share printers and plotters. The EDB-30 (three-port model), EDB-40 (four-port model), and EDB-50 (five-port model) feature the company's Direct Memory Access (DMA) architecture on all input and output ports, enabling buffering throughput of up to 280KB per second. The EDB buffers offer printer-sharing capabilities through multiple parallel ports that can be configured as either input or output ports. They can also connect to output devices via an optional adapter unit.

The units are available configured with 1MB to 12MB of SIMM memory installed and feature three SIMM sockets. Buffer memory is divided into 8KB blocks, and dynamic memory allocation gives you access to the entire buffer memory. Although print jobs are printed on a first-in-first-out basis, a First Finish algorithm gives small print jobs a quick path to the printer, provided a larger job has not started printing. A copy function prints up to 99 copies of a print job without resending the document.

•List price: *EDB-30 (1MB model)*, \$599; *EDB-40 (1MB model)*, \$649; *EDB-50 (1MB model)*, \$699. *Kansai Electric USA*, 2005 Hamilton Ave., #220, San Jose, CA 95125; 800-733-3374, 408-377-7062; fax, 408-377-7085.

Circle 405 on reader service card

BRIEFS

Mailing List Management

AddressMate Software's update, AddressMate, Version 1.5 (\$99.95), provides automatic envelope addressing and bar coding. The update offers simplified name retrieval from its integrated database and faster envelope printing. 510-237-7460; fax, 510-237-7437

E.R.M. Associates is shipping ErmaSoft Laser Envelopes, Release 3.2 (\$59.95), a software utility for printing envelopes on HP or compatible laser printers with a variety of fonts. The new version adds support for PostScript printers and postal bar codes. 800-288-3762, 818-707-3813; fax, 818-707-1510.

PostSaver Systems' new Postnet bar code TSR program, Bar_Lite, (\$99) works with existing accounting, database, and wordprocessing programs to print ZIP+4 bar codes. 313-299-5050; fax, 313-299-5052.

SoftSpoken is now shipping SoftSpoken Mailer for Windows (\$295), a new mailing list management software that provides Postnet bar code printing, presorting of bulk mail for automation-compatible rates, and elimination of duplicate mailing list database records. 919-870-5694; fax, 919-870-5696

CAD

4D Graphics is shipping 4D Menu (\$245) for the company's Personal Designer CAD package. 4D Menu is an on-screen icon-based menu system that maximizes the available drawing space by placing commands and modifiers around all four edges of the drawing area. The package features context-sensitive help, an interactive tutorial, dynamic dragging, on-screen file selection, dual dimensioning, section arrows, and assisted plotting. 206-228-4608; fax, 206-228-2537.

Abbot, Foster & Hauserman has unveiled 3-D MiniCAD for Windows, Version 1.0 (\$129), a low-cost 3-D modeling package with landscape

NEW

More Action in Active-Matrix Color Notebook Arena

Sharp Electronics is shipping the PC-6881, a 5.9-pound notebook PC with an 8.4-inch active-matrix TFT (thin-film transfer) color VGA display. The unit features a 386SL/25 processor, 2MB RAM (expandable to 8MB), an 80MB hard disk, a PCMCIA slot, an internal 1.44MB 3.5-inch floppy disk drive, and an integrated trackball placed above the keyboard.

Zenith Data Systems' new addition to the Z-series of modular, network-ready systems, the Z-Note 325Lc Model 120, is a 6.5-pound notebook PC with an 8.4-inch active-matrix TFT color VGA display. The unit features



The PC-6881 and the Z-Note 325Lc Model 120.

an Ethernet chip set on the motherboard and a built-in thick Ethernet adapter. It has a 386SL/25 processor; 4MB RAM (expandable to 12MB); a 120MB hard disk; an internal 1.44MB 3.5-inch floppy disk drive; and Client shells for LAN Manager, NetWare, and VINES networks preinstalled.

•List price: *Sharp Electronics PC-6881*, \$4,799. *Sharp Electronics Corp.*, P.O. Box 650, Sharp Plaza, Mahwah, NJ 07430; 800-237-4277, 201-529-9593; fax, 201-529-9637.

Circle 406 on reader service card

•List price: *Zenith Data Systems Z-Note 325Lc Model 120*, \$4,999. *Zenith Data Systems*, 2150 East Lake Cook Rd., Buffalo Grove, IL 60089; 800-553-0331, 708-808-5000.

Circle 407 on reader service card

NEW

Investment Protection with Upgradable Wyse System

Wyse Technology's Decision 486si features a new local-bus graphics video subsystem called Hyper16 Video, developed by Tseng

New & Improved

Labs and Wyse, to enhance the performance of graphics-intensive applications. It interfaces directly with the CPU via a double-decoded 16-bit-wide local bus, which lets it run up to 33 MHz, according to the company. The system also offers a measure of investment protection with its Zero Insertion Force (ZIF) processor socket on the motherboard. You can upgrade CPUs quickly and easily simply by flipping a lever.

The Decision 486si accommodates 16-MHz to 33-MHz 486/SX and 486/DX processors, as well as 50-MHz and 66-MHz DX2 processors and the OverDrive upgrade processor. The Hyper16 Video subsystem offers 512K VRAM and can be upgraded to 1MB to accommodate 256 colors at a resolution of up to 1,024-by-768 noninterlaced. The system ships in standard configuration with 4MB RAM and provides five drive bays.

•List price: *Decision 486si DX/33*, \$1,729; *Decision 486si DX2/50*, \$1,999; *Decision 486si DX2/66*, \$2,399. Wyse Technology Inc., 3471 N. First St., San Jose, CA 95134; 800-438-9973, 408-473-1200; fax, 408-473-1972.

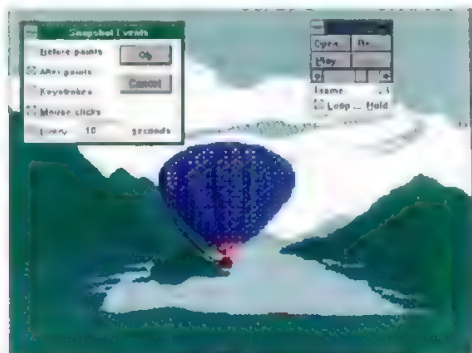
Circle 408 on reader service card

NEW

Animation Utility Lets You Direct Your Own Movies

Quiet on the set! Movie, Version 3.4, is a Windows animation utility from **Lantern** that creates animated sequences by capturing areas of a screen and playing back the images to simulate motion. The utility (now in Version 3.4 but actually the package's first commercial release) has the same standard Play, Record, Stop, Pause, and Speed control functions as a VCR. It also has additional functions, such as Loop for continuous play and Hold to pause between loops.

When creating frames, the Window Relative function joins captured areas to a movable window. The Auto Record function can be set to record during specified events, such as keystrokes and mouse clicks. With the script lan-



Movie lets you configure snapshot settings.

BRIEFS

CAD

design, office layout, and dimensional mechanical drawings capabilities. Three-dimensional objects can be viewed from any angle and rotated, scaled, and shaded. A solid-model display option shows shaded rendering of objects, while the wire-frame display option provides easy editing. 800-562-0025, 509-466-8776; fax, 509-466-0774.

Armasi is shipping new raster-to-vector/vector-to-raster conversion for **Evolution Computing's** EasyCAD 2 and FastCAD programs. Pcxit, Version 1.0, converts standard .PCX files directly into the binary .FCD file format used by EasyCAD 2 and FastCAD. For information, contact Armasi at 800-848-2955 or Evolution Computing at 603-967-8652.

Automated Methods is shipping Ultimate CAD Windows, Version 1.1 (\$695), a drafting and design package for Windows 3.1. The package provides a list of drawing primitives, including ellipses and splines; geometric functions such as chamfering, parallel lines, and tangent lines; and editing and selecting tools. Objects can be stretched, rotated, and locked into position. Ultimate CAD supports a wide variety of tablets, digitizers, and plotters. 800-231-4086, 915-744-0856; fax, 915-778-1988.

AutoSight has released ProView, Version 4.0 (\$299), and MINI, Version 4.0 (\$99). ProView is an update to the company's Access 3.0 CAD file access software package. ProView 4.0 features enhanced display speed, AutoCAD line types, entity thickness, wide polylines, support for three-dimensional viewing, and expanded printer support. MINI 4.0 is a CAD viewing, printing, and plotting package. The update includes new features such as three-dimensional viewing and support for HP and compatible plotters, as well as HPGL2 plotter files. 407-242-5865; fax, 407-255-1052.

CADcam is shipping P-CAD Master Designer, Version 6.0 (\$8/495), a

language, you can create detailed presentations from individual segments, and display frames in any order for various lengths of time.

•List price: *Movie, Version 3.4*, \$49. **Lantern Corp.**, 63 Ridgemoor Dr., Clayton, MO 63105; 314-725-6125 (voice and fax).

Circle 409 on reader service card

IMPROVED

QBE Vision 2.05 Front-End Supports QBE and SQL

Coromandel Industries is shipping QBE Vision, Version 2.05, its Windows query and applications-development front end for Sybase, Microsoft, and Oracle SQL databases. Novice users can compose simple queries in a spreadsheet-style table; more complex queries (including conditions, joins, and nested queries) are constructed by example. The resulting SQL code can be viewed and edited in a SQL window, and queries can be stored in ASCII format for general use. Experienced users can generate GUI query applications, and the update provides over 250 system functions, including arithmetic and Boolean expressions, along with *while* and *for* loops. QBE Vision offers DDE (Dynamic Data Exchange), and can be integrated into the menu structure of Microsoft Excel. It also has server administration capabilities including backup and restoration.

•List price: *QBE Vision, Version 2.05*, \$900. **Coromandel Industries**, 70-15 Austin St., 3rd fl., Forest Hills, NY 11375; 800-535-3267, 718-793-7963; fax, 718-793-9710.

Circle 416 on reader service card

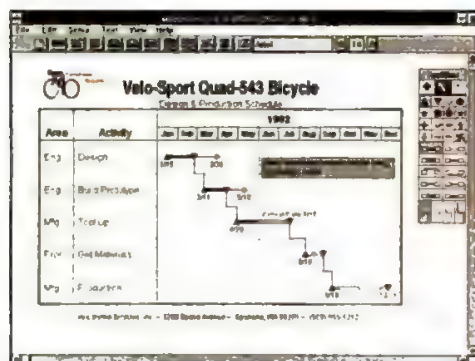
IMPROVED

Milestones, Etc. Gains Button Bar, Symbol Editor

Kidasa Software's project scheduling program for Windows, Milestones, Etc., Version 3.1, has a new button bar containing the most commonly used functions, such as File Open, Save, Page Layout, and Calendar Setup. The update also supports a number of graphics file formats (.BMP, .PCX, .EPS), letting you place and resize clip-art images within the schedule charts.

Milestones, Etc. lets you click-and-drag milestone symbols to the schedule, and now offers a symbol editor for creating custom milestone symbols for specific projects or unique events. Schedules can be designed to include weekends or to shade holidays. It supports the Windows Metafile format, allowing schedules created in the program to be exported to a Windows application such as Excel or Word for

New & Improved



Milestones, Etc., 3.1 has a new button bar.

Windows. Support for Microsoft's common dialogs, such as File Open and File Save, is now standard.

•List price: *Milestones, Etc., Version 3.1*, \$189. Kidasa Software Inc., 1114 Lost Creek Blvd., #300, Austin, TX 78746; 800-765-0167, 512-328-0167; fax, 512-328-0247.

Circle 411 on reader service card

NEW

For Portable PC Users Looking For Power Management...

Lucid Corp.'s portable PC battery power-management utility, *Battery Boost*, Version 1.0, extends battery life by implementing a series of power-saving options such as screen blanking and reducing hard-disk access. The utility also provides a Deep Discharge feature, which fully drains nickel cadmium batteries, eliminating the "nickel cadmium memory effect" that can occur when a battery is recharged before it is fully discharged.

With *Battery Boost*, you select a period of inactivity and the utility will turn off the screen backlighting and the hard disk motor. A key-stroke revives all subsystems. The utility also offers an on-screen battery gauge that shows the power level percentage and estimates the minutes of life remaining. Thirteen separate alarm options signal when the power runs low.

•List price: *Battery Boost*, Version 1.0, \$79.95. Lucid Corp., 101 W. Renner Rd., #450, Dallas, TX 75082; 800-925-8243, 214-994-8100; fax, 214-994-8103.

Circle 412 on reader service card

NEW

LanGarde 400 Keeps Your Network Up and Running

EFI Electronics has unveiled the LanGarde 400, a combination uninterruptible power supply (UPS) and surge suppressor. The

BRIEFS

CAD

printed circuit-board design package that now offers a 32-bit database to handle dense PCB designs. The P-CAD Master update features a new interface, accelerated graphics performance, and auto-dimensioning and resequencing. The company is also offering Master Router, Version 6.0 (\$5,995), as an option; it provides faster routing capabilities that also work to speed up the design process. 818-841-9470; fax, 818-840-8428.

Haestad Methods has unveiled an integrated spell-checking utility for AutoCAD. CADmagic SpellCheck (\$95) runs within AutoCAD Release 11, and automatically checks text, attribute definitions, block attributes, and dimension entities. SpellCheck contains a 100,000-word dictionary and will check words in external files. 800-727-6555, 203-755-1666; fax, 203-597-1488.

Monitors

Micro Express is shipping the FM-360 (\$295), a 14-inch Super VGA color monitor featuring .28 mm dot pitch and a maximum resolution of up to 1,024-by-768, interlaced. 800-989-9900, 714-852-1400; fax, 714-852-1225.

RasterOps has unveiled the RasterOps/20T Multiscan (\$3,499) and the RasterOps/20 Multimode (\$2,499) 20-inch color monitors. The RasterOps/20T Multiscan offers a maximum resolution of up to 1,280-by-1,024, and a refresh rate of up to 120 Hz. The RasterOps/20 Multimode offers a maximum resolution of up to 1,024-by-768, and a refresh rate of up to 120 Hz. 408-562-4200; fax, 408-562-4065.

Samtron Displays is shipping the 17-inch SC-762V, a noninterlaced color monitor that offers a .28mm dot pitch and a maximum resolution of up to 1,024-by-768. The unit is both VGA and VESA compatible. 310-802-8425; fax, 310-802-8820.

unit is designed for networks and provides power outage warnings, battery condition monitoring, and automatic file saving and network shutdown features. The unit operates as a line-interactive UPS, providing 15 minutes of sine wave output power when connected to a 386 workstation, and has user-replaceable batteries and a detachable front panel display that lets you keep the unit out of the way while you monitor its status.

During a power outage, LanGarde 400 employs the proprietary software NetTrax to notify the LAN administrator of the outage and report how long the battery will keep the network running. If the network is not shut down by the administrator, the unit will automatically save files and shut down connected systems.



LanGarde 400 keeps your system up and running.

•List price: *LanGarde 400*, \$499.95. EFI Electronics Corp., 2415 S. 2300 West, Salt Lake City, UT 84119; 800-877-1174, 801-977-9009; fax, 801-977-0200.

Circle 415 on reader service card

NEW

Above Software's Golden Retriever Comes When You Call

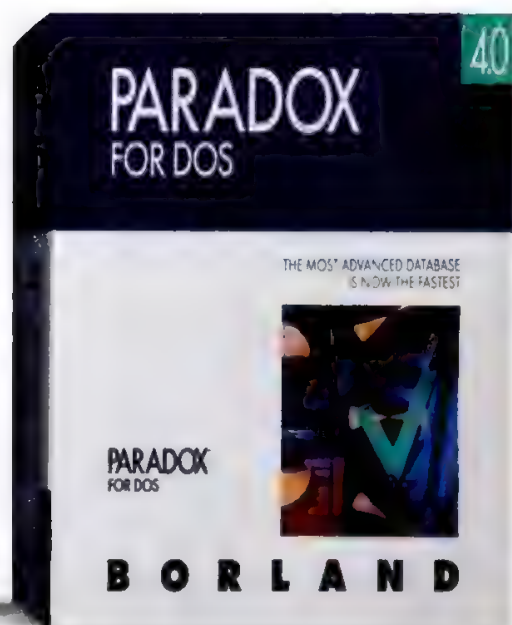
Above Software is now shipping its Golden Retriever file management and retrieval system for Windows, which lets you supersede the eight-character DOS file-naming restrictions and use names up to 256 characters long. The package organizes the Windows desktop into file folders inside file drawers where files are stored by category, not by directory and subdirectory, or by the application used to create them. When a file folder is opened, you click on the name of the file and the program launches the appropriate application and opens the file.

•List price: *Golden Retriever*, Version 2.0, \$99. Above Software Inc., 2698 White Rd., #200, Irvine, CA 92714; 800-344-0116, 714-851-2283. Circle 413 on reader service card

DEMAND PERFORMANCE

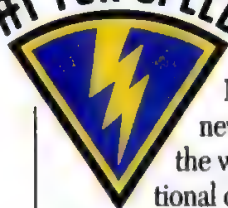
Introducing Paradox 4.0 for DOS

*The most
advanced database
is now the fastest*



DEMAND

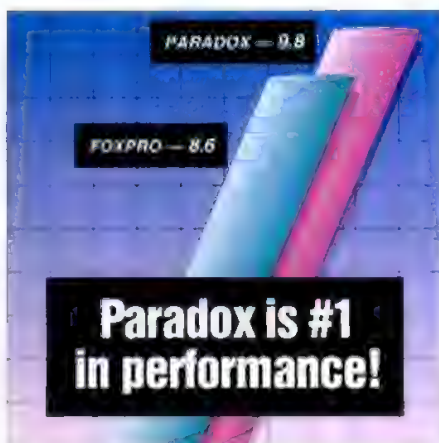
#1 FOR SPEED



Paradox is fastest

NSTL results prove new Paradox® 4.0 is the world's fastest relational database! Thanks to Borland's new WarpSpeed™ performance, Paradox 4.0 sets the standard in performance for both network and standalone use. For you, this means faster answers to queries, faster memory access and faster multiuser applications.

In fact, Paradox 4.0 gives you unparalleled performance throughout all aspects of database management and application development. As NSTL put it, "Paradox is clearly the best all-around product evaluated." It beats FoxPro hands down.



Software Digest's NSTL report rates Paradox highest of all databases tested in Overall Power and Performance.

New Windows-like interface

Our new Windows-like interface makes using Paradox 4.0 more intuitive than any other database. Context-sensitive SpeedBar™ controls give you instant access to your frequently used commands and features. Movable, resizable windows, pull-down menus and mouse support make creating and editing your database simple. And new dialog boxes give you the choices you need in one place, saving time and effort.

The fastest way to get an answer

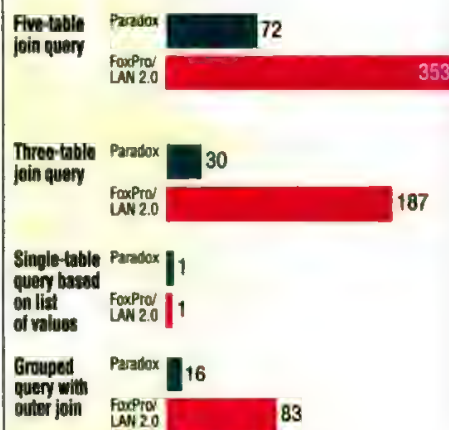
Paradox pioneered Query By Example (QBE), the easiest way to get answers from your database. Now, a built-in query optimizer enhances QBE, automatically finding the fastest path to the answers you're seeking. Plus, multi-table forms and reports make everything from data entry to presentations a snap—all without programming.

WarpSpeed

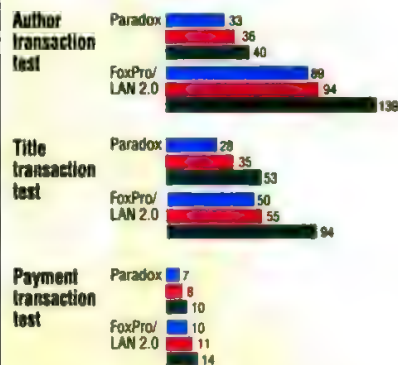
WarpSpeed stands for Wildly Accelerated Relational Performance. It reflects Borland's commitment to performance, and is also an integral part of our dBASE® and InterBase™ development programs.

NSTL tests confirm Paradox 4.0: Quicker than a Fox

Single-user performance tests (in seconds)



Multiuser performance tests (in seconds)



Multiuser Legend:

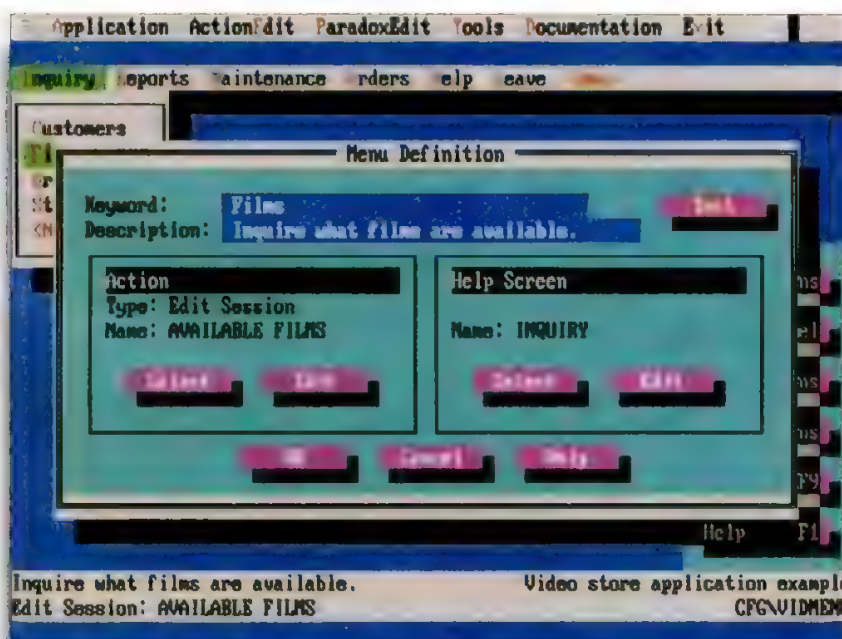
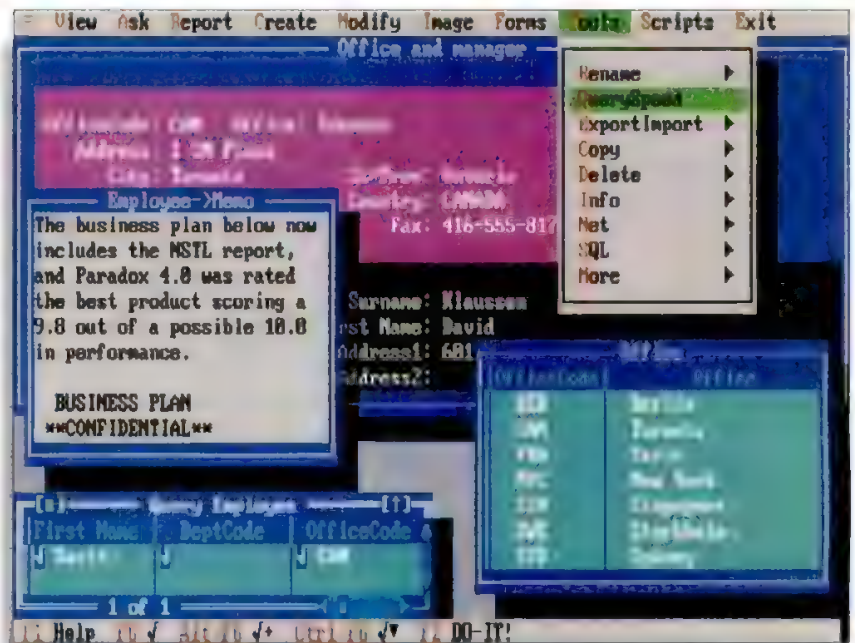
1 station ■ 3 stations ■ 8 stations ■

To test the speed of transaction performance, NSTL designed a database for book order entry. Each record contained an author, a title, an ISBN number, a price and inventory information. The database contained 25,000 books and 5,000 authors.

PARADOX

New memo fields

Paradox 4.0 gives you the power to manipulate data you couldn't manage with ordinary databases. With new variable length memo fields, you have the ability to effortlessly manage large amounts of text information throughout your applications. And you can store anything you want in the new binary field—word processor documents, sound, bitmapped graphics, multimedia data—and then manipulate it under program control. Each can hold up to 256Mb of data per field—up to 4 gigabytes per table! There's no easier way to manage large applications.



◀ With the new Applications Workshop, you can build complete applications that include pull-down menus, mouse support, transparent multiuser edit sessions and more. Best of all, it's simple!

Efficient memory management

Paradox 4.0 gives you the best way to manage memory. VROOMM™ with Turbo Drive™ provides more available memory and more efficient memory utilization. So Paradox 4.0 runs on any 286 PC or above. In addition, Paradox 4.0 can run as a DOS application under the Microsoft® Windows operating environment, thanks to complete DPMI support.

DEMAND

The most award-winning database

Since its introduction, Paradox has won more awards for technical excellence and customer satisfaction than *any* other database. Awards from every major computer magazine and periodical from around the world. In addition, in the J.D. Power and Associates* survey,* Borland ranked as the #1 (tied) Application Software Publisher in Customer Satisfaction Among Business Users. All of which has made Paradox the favorite of users and developers alike.



May 28, 1991
Paradox, Version 3.5



March 1992
Paradox 3.5



PARADOX® 4.0



Rated # 1
Vol. 9, Number 2
May 1992



PARADOX® SQL LINK



Rated # 1
Vol. 8, Number 2
February 1991



May 1991
Paradox 3.5

Faster network performance

Paradox 4.0 is the fastest multiuser network PC database ever. And it's network-ready right out of the box. Multiple users can read, write and modify data simultaneously. You get all this, plus new automatic group lock security that allows multiple users to share data flexibly, providing dramatically increased performance. Just another reason Paradox 4.0 is the best investment for your business.

Transparent access to SQL data

With Paradox SQL Link (sold separately), you can seamlessly access remote SQL data. You can then work with this data using standard Paradox features such as Query By Example. Paradox does all the translation for you.

Paradox SQL Link completely shields you from the intricacies of PC and database server communications. When you specify an SQL table operation, Paradox SQL Link automatically selects the correct communications protocol, opens up

Paradox Developer's Corner

Powerful, procedural language

The Paradox Application Language (PAL™) lets you create sophisticated Paradox applications quickly. PAL procedures allow for private and global variables, array passing and variable scoping. Paradox 4.0 includes more than 90 new commands and functions.

Powerful UI controls

Easily construct your applications with a robust look and feel using the built-in UI controls: non-modal pull-down menus, dialog boxes (with push buttons, check boxes, radio buttons, pick lists, type-in lines and more), pop-up menus, mouse support and multiple overlapping windows.

Event-driven extensions

GetEvent() passes keyboard, mouse and/or system events into your procedures for dispatching. Use dynamic arrays to pass dynamically created data structures to procedures. This greatly increases the modularity and reusability of your code.

Leverage Paradox behavior

Build on Paradox's multiuser support for automatic locking, multi-table forms and referential integrity. Define special error-handling procedures to trap and process error conditions, giving you complete flexibility over users' interaction with your custom application.

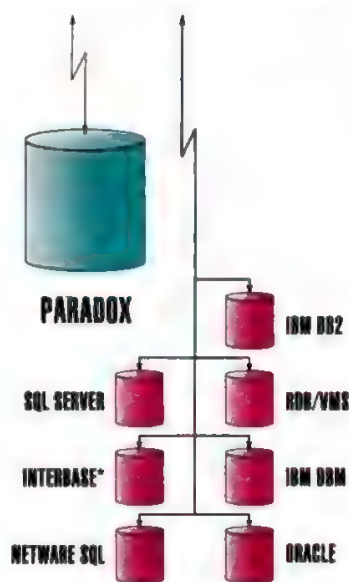
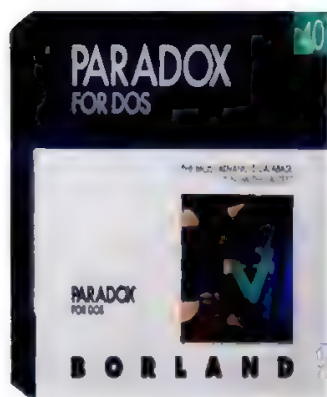


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BORLAND



*Paradox SQL Link supports more industry-standard database servers than any other PC database available. (*And the InterBase SQL connection will be available soon.)*

a communication link, relays statements to the database server and presents the results of your query.

By using Paradox SQL Link, you can now enjoy the benefits of SQL databases without the difficulty of mastering the SQL programming language. In addition, Paradox SQL Link operations follow database server security restrictions.

Borland—the database leader

Borland is the acknowledged leader in PC relational databases. More users and developers trust their data to Borland products than any other company. And an integral part of that trust is Paradox.

Paradox 4.0's power to create and manage sophisticated applications, maintain data integrity, handle large quantities of data, perform complex database operations and connect to corporate data is critical to the success of a database management system today. No other PC database meets this challenge like Paradox 4.0—the most advanced database. Best of all, with Paradox 4.0's 60-day, money-back

guarantee, you can order risk-free today. So demand the best. Demand Paradox!

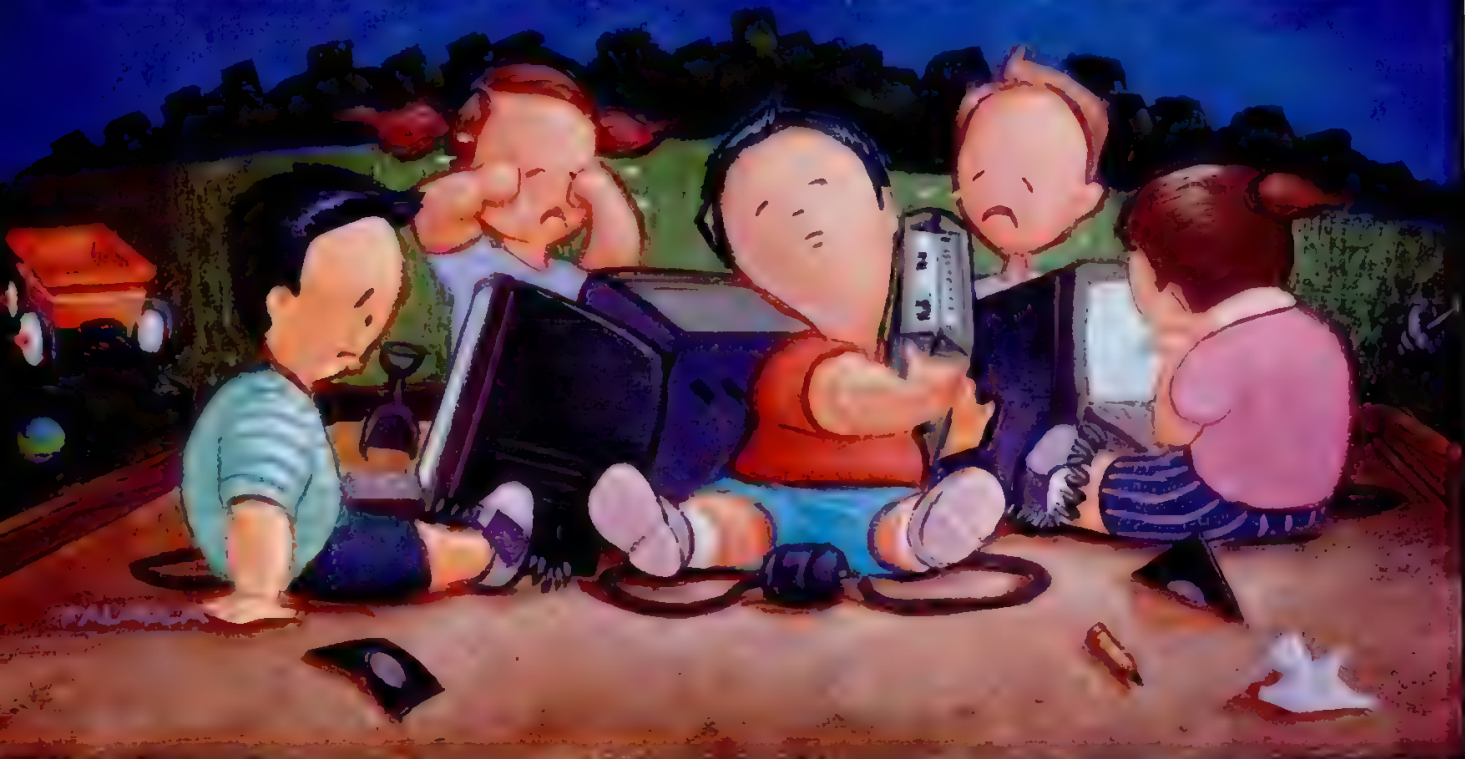


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But the MultiComAsyncGateway^{TSR} Eases Users Into Modem Sharing ... Inexpensively and Risk-Free.

Most LAN managers know that modem sharing is cost effective. But they're reluctant to invest in a dedicated gateway, for fear of resistance and confusion among users. The MultiComAsyncGateway^{TSR} can get users accustomed to communications via a modem attached to another PC, without spending thousands on a full-blown gateway.

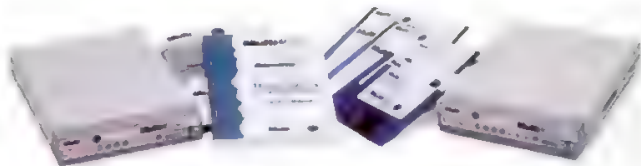
Think of it as a Gateway "Trainer."

For under \$400, the MultiComAsyncGateway^{TSR} is a functional modem sharing system that lets users access one or two modems attached to another PC - any other PC - on the LAN. You can even make use of an "obsolete" 286 by making it the non-dedicated communications server for your modem pooling.

Sharing Modems is Easier Than You Think.

Thanks to the MultiComAsyncGateway^{TSR}, it's never been easier. And there's never been an easier or more risk-free way to test whether the benefits of gateway technology can benefit your network.

When it comes time to upgrade to a high performance, dedicated gateway ... like the MultiComAsyncGateway2 ... the price of the MultiComAsyncGateway^{TSR} is credited back to you. For more information, call us at 1-800-328-9717.



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Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Carol Levin

Undocumented Windows Fills In the Whole Picture

BY BEN MYERS

First there was *Undocumented DOS*, which became an overnight programming classic. Now, authors Andrew Schulman, David Maxey, and Matt Pietrek visit more undocumented terrain in *Undocumented Windows: A Programmer's Guide to Reserved Microsoft Windows API Functions*, where they tie together the official, disparate sources of Windows programming material and provide a richer, more complete picture of Windows' architecture.

Why would you need to know Windows' 250 undocumented functions? Simply be-

cause the functions documented in Microsoft's Software Development Kit (SDK) and Device Driver Kit (DDK) don't let you access components of Windows and DOS that are essential for getting certain things done. *Undocumented Windows* clearly explains how Windows' components relate to one another and reveals the undocumented insides of the Windows executive, its 286 and 386 kernels, the Graphics Device Interface (GDI), and the ubiquitous user module (USER.EXE).

The authors have researched their subject meticulously. Some functions are treated lightheartedly (User-SeeUserDo, Death, and Resur-

rection). Others, such as the obscure flags that crept into Windows 3.1 with the compatibility section of WIN.INI, are examined in unprecedented detail. The officially documented functions deserve explanations at least as good as these.

With the accompanying disk of programs the authors used for spelunking into the dark corners of Windows, you can decode Windows programs, trace the structure of a running Windows environment, and watch software interrupts and undocumented messages. The disk also has the source code and other trappings needed to build the programs, as well as the WINIO library, a portable set of functions that makes it easy to build text-oriented Windows programs

similar to the programmer's tools on the disk.

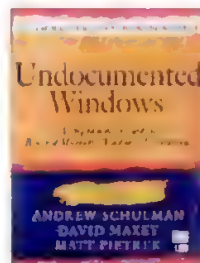
Even if you are not a serious C programmer, you can benefit from studying the programs and extending them to do your own prodding inside Windows. *Undocumented Windows* will take a place of honor on your

bookshelf next to the SDK references and Charles Petzold's classic *Programming Windows*.

• *Undocumented Windows: A Programmer's Guide to Reserved Microsoft Windows*

API Functions, by Andrew Schulman, David Maxey, and Matt Pietrek, \$39.95. Addison-Wesley, One Jacob Way, Reading, MA 01867; 800-447-2226, 617-944-3700. ISBN 0-201-60834-0.

Circle 467 on reader service card



Programming in Windows Without Trying Too Hard

BY M. DAVID STONE

Anyone who spends time on CompuServe's Microsoft Word forum knows Woody Leonhard as one of the most knowledgeable and gracious voices on the forum. He's also the author of *A Hacker's Guide to the Univers*, a collection of tips, bug reports, and insights into Microsoft Word for Windows and WOPR, a popular program for WinWord. Given the author's credentials, it's not surprising that *Windows 3.1 Programming for Mere Mortals* seems likely to become a



popular introduction to programming for Windows in both Visual Basic and WinWord's own WordBasic.

If you think programming can only be taught with boring textbooks filled with impenetrable jargon, prepare for a surprise. Leonhard's writing style is irreverent, with a tendency to bite the Microsoft hand that feeds him. *WinMortals* is actually fun to read. It's also highly informative. To set the tone, Leonard says: "We're going to use a different kind of notation from what you're used to seeing in

computer books. . . . It's called English."

The author makes good on his promise. Here is his explanation of DLLs: "Don't let the three-letter acronym put you off. A DLL is just a subroutine or bunch of subroutines. . . . *Windows itself* is just a collection of DLLs. . . . *Imagine the power! Imagine the flexibility! Imagine the crashes!*"

He also explains the right way (not "correct syntax") to use the If. . . Then. . . Else. . . End If command: "The rule of thumb: you need an 'End If' statement if there is a carriage return after the 'Then' statement. . . . You must have a carriage return after 'Else' if and only if there is a carriage return after the 'Then.' Not entirely straightforward, would you say?"

The command may not be

straightforward, but Leonhard's explanation certainly is. *WinMortals* assumes a nodding acquaintance with programming, and if you're comfortable with, say, word processor macros, that should suffice. Working your way through *WinMortals* and the accompanying disk is like having a smart friend help you explore the nooks and crannies of WordBasic and Visual Basic, with a painless introduction to such arcane issues as API calls and DDE. You'll learn to build your own programs without trying very hard, and laugh along the way. □

• *Windows 3.1 Programming for Mere Mortals* by Woody Leonhard, \$34.95. Addison-Wesley Publishing Co., One Jacob Way, Reading, MA 01867; 800-447-2226, 617-944-3700. ISBN: 0-201-60832-4.

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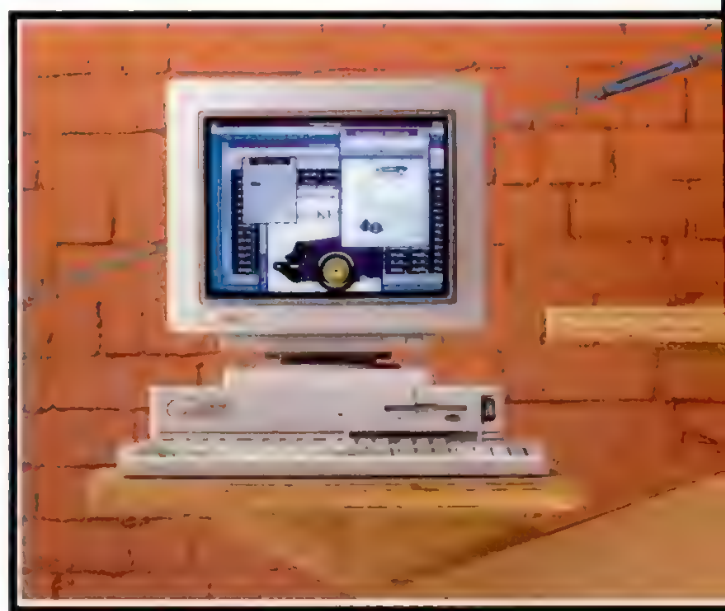
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unfamiliar dimension to mainstream business computing: your voice. The result of a collaboration between Compaq and Microsoft, it allows you, among other things, to actually paste voice messages into spreadsheets and documents. Either as notes to yourself or as voice-mail across your entire network.

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CIRCLE 203 ON READER SERVICE CARD

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CIRCLE 161 ON READER SERVICE CARD

Toolkits

REVIEWS OF THE LATEST TOOLS FOR THE PC PROGRAMMER

Edited by Trudy Neubaus

Power Pen Pal: The Fast Track to Pen-Based Apps

BY GREG PASTRICK

The problem with pen-based computing has not been describing the benefits of the technology as much as illustrating them with real applications. While the advantages of implementing sophisticated functions such as handwriting recognition on small and versatile platforms are enticing, there has been little motivation for taking the step from interest to action. There are no easy answers to questions about which operating environment to support (Microsoft Windows for Pen Computing, MS-DOS, GO Corp.'s PenPoint, Communication Intelligence Corp.'s PenDOS, or GRiD's PenRight!) or which hardware to use (slate, tablet, or notebook). And the absence of accessible programming environments only further deters commitment to the technology.

Pen Pal Associates delivers a DOS-based application development environment in its \$995 Power Pen Pal, Version 3.0, which provides a quick route to creating pen-based applications. It demands no high-end hardware or special environment: A 386 configured with EMS, ample disk space, DOS 5.0, and a mouse is recommended, although a 286 with 640K RAM, DOS 3.x, and a mouse will do. No pen device is required. In addition, Power Pen Pal doesn't require you to be an expert C programmer.

The Pen Pal application de-

velopment environment is tailored for designing vertical applications and is best suited for simple input programs. The logic of creating an application is easy to follow and is based on some standard components. Each application is considered a project, and each project is composed of one or more forms. These forms are composed of dynamic or static objects to which you can attach certain actions or programming instructions. Standard objects, for example, include fields for text and numbers, buttons, check boxes, and frames. A double click on any given object launches a properties window that defines the basic attributes and functions of the object, including default settings for its frame style, size, identifying text, and font usage. To size and place the objects, simply point and drag the objects on a form.

The Actions menu is at the heart of Power Pen Pal's development environment. From this, you can select from a number of functions that let you navigate among forms, select operations to perform on numeric and character variables, direct input and output to text and database files, and enable data communications capabilities. When you choose a function, its syntax is displayed in a window. Once you have specified any parameters, defined any variables, and so on, the generated code will be inserted in your program.

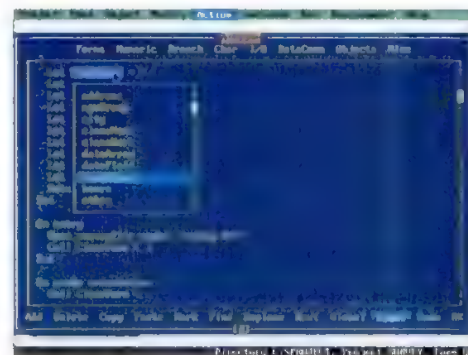
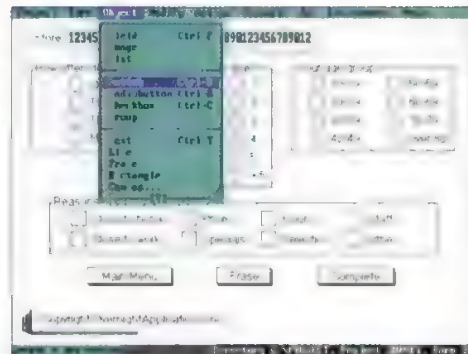
You can also create a pro-

gram by editing and enhancing the skeleton code listing that is generated when you place objects on a form. Power Pen Pal provides hooks into GRiD's PenRight! (a handwriting recognition engine) and also into CIC's PenDOS Handwriter Recognition Systems. If you choose, you can also write your own C code and use third-party libraries.

Once the application is complete, you can compile and dry-run the program directly from the main project menu. Any programming or syntax errors are flagged during the compile, but the rudimentary pop-up help screen gives little assistance in resolving most problems. Perusing the source code of the four applications that come with PPP helps.

A successful compile produces a .RUN file that can be launched on any computer running PenRight!, PenDOS, or MS-DOS. For the last two, you must have PenRight! loaded (placed in EMS by the utility PPLOAD.EXE) as well as the Pen Pal Runtime Control Program (PPCP.EXE) that comes with Power Pen Pal. Or you can download your application to your pen hardware with a null-modem cable; just select Download from the Run menu.

The real key to using Power



The Power Pen Pal project form screen (a) shows the selection of the radio button object, to be placed on the Survey form under construction. The program's action screen (b) holds the program listings for the object activities and illustrates the programming syntax.

Pen Pal is predefining what you want your vertical application to do and what steps you need to take to get there. There's effectively no limit to the number of forms you can link in an application or the number of objects you place on a screen. Your only limits are common sense and an eye for uncomplicated design. □

List Price: *Power Pen Pal, Version 3.0*, \$995. Requires: 286-based system or better, 640K RAM, DOS 3.0 or later, hard disk, VGA display subsystem, serial port, mouse, file-transfer capabilities. Pen Pal Associates Inc., 4970 El Camino Real, #200, Los Altos, CA 94022; 415-903-3850; fax, 415-961-0995.

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In a series of tests, we compared the QMS-PS® 1700 to the HP® LaserJet® III Si. The result? In one 8-hour day, we delivered 2½ times more productivity. From the same 17ppm engine.

The reason is our Crown™ architecture. A unique combination of hardware and software that lets the QMS-PS 1700 print one document while receiving

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QMS-PS 1700

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the QMS-PS 1700 can receive data across standard and optional interfaces, from multiple platforms and multiple networks. Simultaneously.

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We'll use the QMS-PS 1700 to print you a copy of these test results. With our Crown architecture, it won't take long.

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	CA-Cricket Presents (Special).....	109
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	Micrografix Windows Draw.....	95
	Power-Up! Calendar Creator Plus v4.0.....	36
	SW Pub. Harvard Graphics/Win v1.01.....	349
	SW Publishing Harvard Graphics v3.0.....	389
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	American Design CAD v5.0 2D.....	159
	Autodesk Auto CAD v3.5 rel 12.....	2995
	Autodesk Autocad v3.0 (Special).....	140
	Autodesk Generic CAD v6.0.....	269
	Foresight Draft Cad Ultra v4.0.....	245
Communications	Cardinal MB2450 2400bps Int/Bicom.....	46
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Michael J. Miller

Secret Screens, Part II

Secret screens are everywhere. Since I wrote about the ones in Microsoft Windows 3.1, Word for Windows 2.0, and Ami Pro 2.0 in our August issue, I've received lots of letters from readers sharing the ones they've found, and also from some

who don't like the whole concept.

Many readers have discovered that the trick of displaying the four figures in Windows 3.1 works not only from Program Manager, but from most of Windows' applets as well. And a number of readers described this Windows 3.0 trick: First, minimize all your applications, hold down F3 while typing WIN3, release F3, then press the backspace key to get a list of the Windows 3.0 developers. But only Will Musgrove of Chatham, Illinois, wrote in with the Windows 2.x sequence that does the same trick: Hit F1, F5, F9, F4, Backspace.

One of the first letters I received was the most complete. Mark Shook of Oklahoma City submitted a long list of Windows doodads for Windows 3.0, Word for Windows, The Norton Desktop for Windows, Visual Basic, Excel, and hDC's family of applications.

He was the first person to unveil Excel 4.0's secret. First, make the Standard Tool Bar visible. Then, right-mouse-click on it, click the Customize option, and select Custom from the Categories list box. Drag the Solitaire icon (a pack of cards, top row) to any empty spot on the Standard Tool Bar. Under Assign to Tool, click OK, then Close. Now hold the Ctrl, Alt, and Shift keys and click on the newly added Solitaire icon. You'll see an Excel logo clean up after a buggy replica of the Lotus 1-2-3 logo.

The most frequently cited secret screen was the one in Excel 3.0. Readers pointed out several variations on this one from E.W. Mandoky of Venice, California. They all start with moving to the last cell in the worksheet by hitting F5 and typing "iv16384." Use the scroll bars to make sure that the last row and column are the only ones visible. Adjust the row height and column width to zero so that the Select All Cells button is the only

button on screen. Click on it. A large Excel logo drops to the bottom of the screen, crushing the 1-2-3 logo.

FROM AGGRESSIVE TO MILD

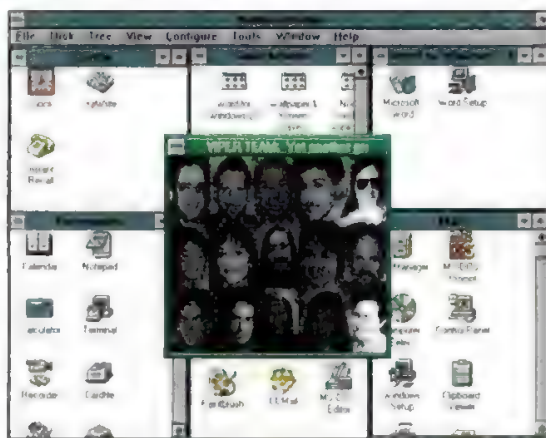
Considering Excel's repeated attacks on 1-2-3, and Word for Windows' attack on WordPerfect, Microsoft is the most aggressive developer of secret screens. All of the other screens I've seen are mild in comparison.

Mr. Musgrove also noted the secret screen in Windows Write 3.0. With a new document open, hold down the Ctrl key while you right click in the "Page 1" area at the bottom of the screen. Then select About Write in the help menu. The dialog box proceeds to fill up with balloons.

Here's another one he found in Word for Windows 1.x: Pull down the Format menu and select Define Styles. In the dialog box, click on Options to bring up additional controls. Enter Normal in the Based On box, which will cause an error box to appear. Click on OK to clear the error, then click on Cancel. From the Help Menu, select About, and with CapsLock on, hold down the O, P, U, and S keys. Release them and the box turns into a fireworks display with the names of the developers scrolling by.

In fact, the primary goal of most of these secrets is to list the application's development staff. hDC's FileApps, Power Launcher, and Windows Express share this secret in another tip from Mr. Shook. Select the About box from the Help menu. A little animation appears. Press the Ctrl and Shift keys while double-clicking on the star at the end of the animation and a list of credits appears.

David B. O'Donnell of Providence, Rhode Island, notes that pressing Shift and Ctrl while clicking on the icon in the Amish



Readers share their clues to more hidden screens. Some voice concerns about the whole idea.

Michael J. Miller

Desk utility of Amish Utilities for Windows displays a credits graphic with fireworks.

Robert Myers of Kansas City, Missouri, offers this CorelDRAW 3.0 (Revision B) tip: If you pull up the About screen and hold the Ctrl and Shift keys while double-clicking on the Corel balloon icon, you'll see a new screen with a balloon at the bottom. Next, hold down the left mouse button, and the balloon will start to rise, towing a banner listing the Corel developers. Release the button, and the balloon starts to sink.

From Robert Stone of Schodack Landing, New York: If you go into the Program Manager and change the icon for IRMA Workstation for Windows' EMU.EXE, your choices include a picture of someone he suspects is the lead programmer.

Several readers pointed out the secret screen in The Norton Desktop for Windows. From the Help menu, select About. Hold down the N, D, and W keys and click two or three times on the NDW icon. Photos of the NDW development team appear, along with a few quotes from the group dis-

played in the title bar. But only Shawn Wallack of New York City discovered that you can enlarge the individual images by drawing a box around one of the developers and clicking with the left mouse button. The right mouse button restores the screen.

I'm not sure what to make of this tip from Greg Carroll of Huntsville, Alabama: In Procomm Plus for Windows, there's a credits screen readily available from the About box. Move your cursor into the credits screen and a cartoon face pops up.

Peter S. Young of Mill Valley, California found the following secret in the About box of Calera's WordScan Plus. The screen displays the box cover, and by clicking on the left or right red squares in "Calera" or in the purple "O" in OCR, you'll see a list of contributors. But if you click on the copyright symbol, your PC performs Wagner's "Ride of the Valkyries." Can multimedia secret screens be far behind?

Lest you think all this activity is confined to Windows, Sherwin Zadeh of Los Angeles found an IBM OS/2 2.0 screen. Minimize all your programs and hold Ctrl, Shift, Alt, and the letter O. A beach scene (Boca Raton?) is displayed along with the names of the OS/2 developers.

Like so much in the PC world, secret

screens seem to have started out on the Macintosh platform. On the Mac IIci, if you set the date to the date of the machine's introduction and hold down command-CI, you'll see a full-color picture of the development team. And if you had an original Macintosh, the secret wasn't in the software. Instead, the names of the development team were inscribed on the inside of the case.

THE CASE AGAINST SECRET SCREENS

As you can see, plenty of readers shared the secret screens they found, but a few readers were offended by the idea of software developers taking up users' disk space and memory to hide these secrets. As several readers mentioned, in most cases, the secret screen code stays on disk until it is accessed by a certain sequence of events, but there has to be some space devoted to recognizing when those events occur. Many readers thought that developers should all have a simple, easily accessible credits screen instead of all these hidden secrets.

In a practical sense, they're right. Creating secret screens takes developer time, and the resulting code needs disk space and often a little memory. But software is still as much art as science, and I suspect we'll be seeing secret screens for a long time. □



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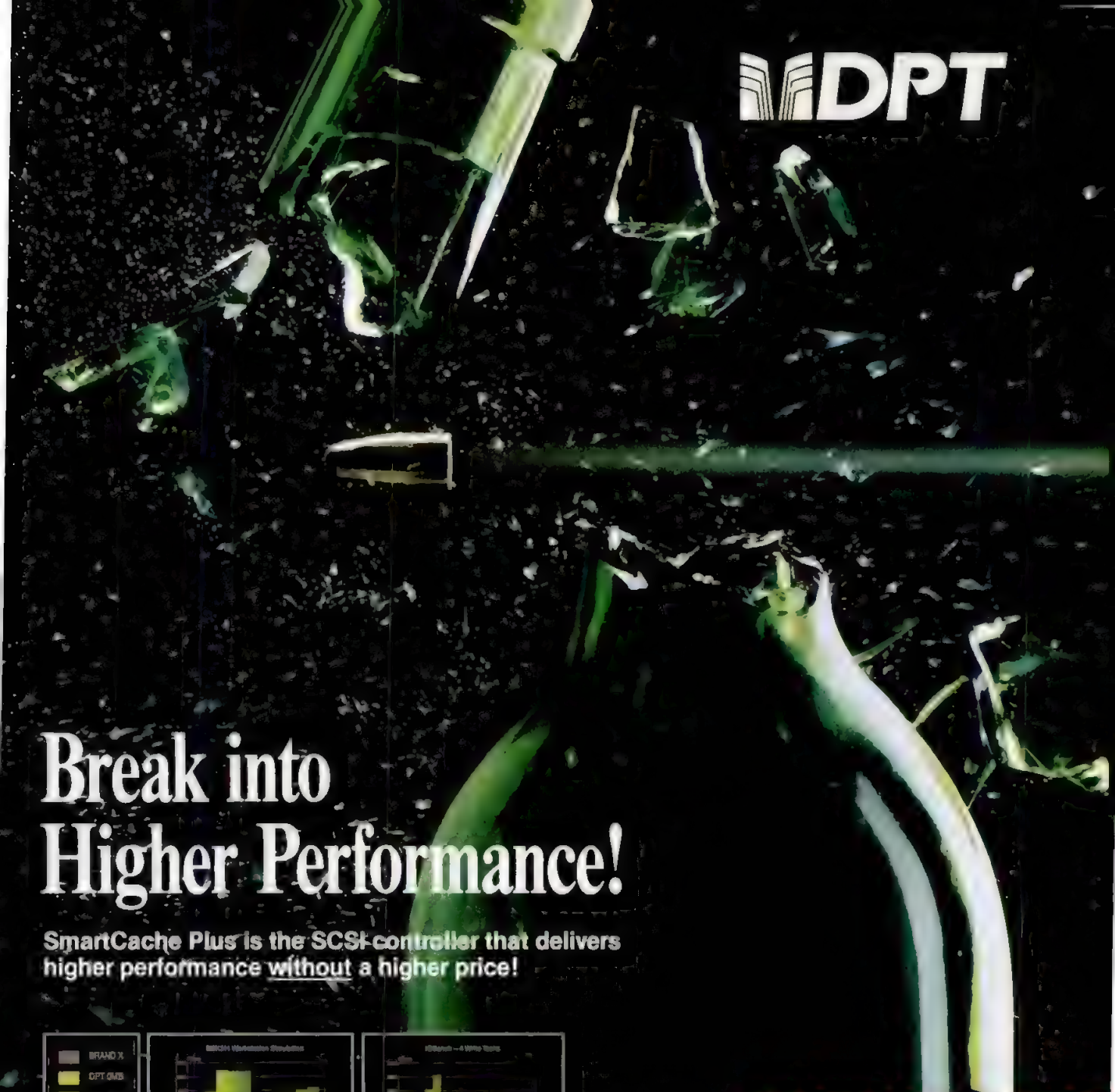
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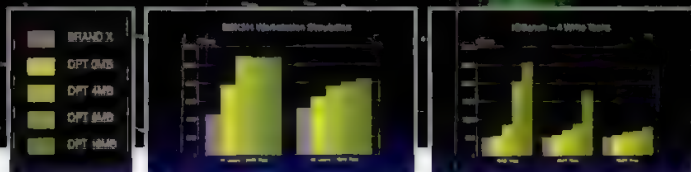
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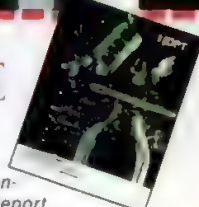
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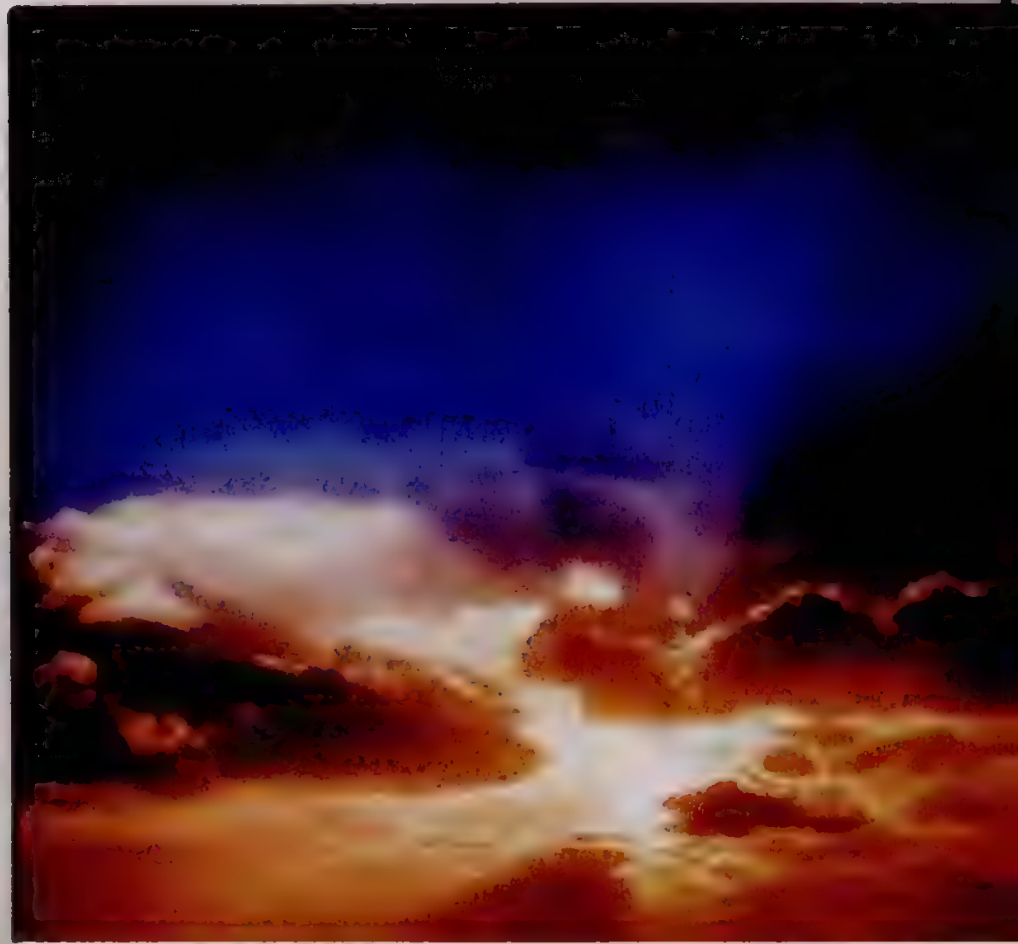


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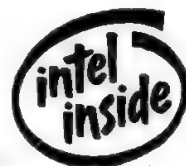
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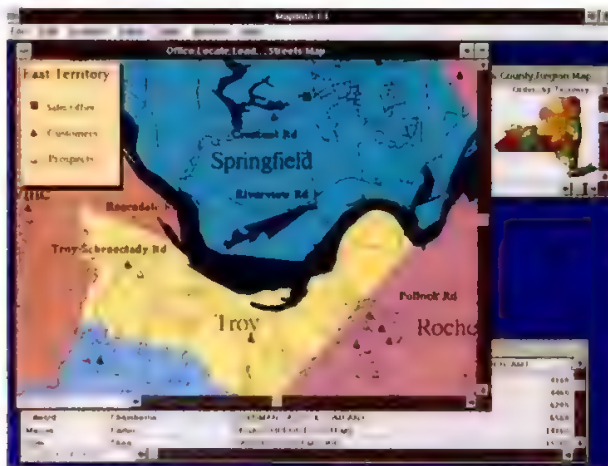
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Bill Machrone

Shareware to the Rescue!

A Band-Aid won't stop you from bleeding to death, but it's a start. Only six months have passed since my tirade about the deplorable state of Windows software and how once you install it, you're pretty much stuck with it

("The Great Windows Software Scandal," May 26, 1992). Since then, my compatriot, Jim Seymour, has filed his indictment of Windows programs' inability to uninstall themselves ("The Uninstall Crunch," August 1992), and a host of readers have written in, jubilant that we've thrown down the gauntlet. As you may have seen from the Letters column, many readers are suggesting that *PC Magazine* should deny Editors' Choice to products that can't uninstall themselves, or that exhibit similarly rude behavior such as creating program groups or modifying your AUTOEXEC.BAT and CONFIG.SYS without your permission. I concur.

Six months isn't enough time for Windows software vendors to mend their ways, but it is enough time for clever programmers to seize an opportunity. Within days of my column being published, I received a shareware program, Uninstall (\$45 from Anyware Software), that helps you uninstall files by taking a snapshot of all the relevant files and directories on your disk before and after you install a program. By bracketing every installation with snapshots, you can roll back your system to any previous state.

Of course, there are loopholes and gotchas, but short of Windows' maintaining a comprehensive database of all file activities, it's the best we can do until the applications vendors catch up. You could also try an uninstall utility called INCTRL, the Installation Control Program for Windows, that Neil Rubenking wrote for *PC Magazine's* Utilities column (July 1992). It supervises and reports on an application's installation so you can easily undo the changes when you need to uninstall a program. Some of these programs are more ambitious than others; all are progress. You can find Rubenking's handiwork on

PC MagNet, and you can find the shareware program on PC MagNet and on many bulletin boards across the country. If you try out a lot of Windows programs, check them out. (Anyware Software: 616-983-5215.)

BOOKS ON-DISK?

One of the most often asked questions I get as I travel around the country is, "When will *PC Magazine* be delivered on disk instead of paper?" The question comes from techno-freaks as well as the environmentally concerned. The short answer is, "no time soon," for several reasons. The sheer information density of *PC Magazine*, its graphics, and its advertising content are insurmountable obstacles for even the most intrepid electronic publisher. Instead, we're finding more and more ways for electronic media to work synergistically with print media, to make the printed portion even more valuable.

Other electronic publishers remain undaunted. I've seen two recent examples that clearly mark the ends of the spectrum of possibilities. One is the ultimate artistic statement: a disk-based book that erases itself after you read it. William Gibson's *Agrippa (A Book of the Dead)* is meant to be ephemeral, since it's about Gibson's memories of his father, who died when Gibson was a child. Short of light-sensitive pages or dangerous chemicals, a disk-based book is the only way Gibson could achieve his desired effect.

The experience doesn't come cheap, however. One version of the book is \$450, another \$1,500. Gibson, author and creator of the science fiction genre known as cyberpunk, gets a measure of artistic control that is denied most of his peers. (Kevin Begos Publishing: 212-650-9324.)

Another book/disk that recently crossed my desk advocates another



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kind of control, the control born of self-determinism. *Amazing New Truths About Your Emotions*, by Doyle P. Henderson, is an unabashed self-help book. It promises to change your life, and it makes no concessions to modesty. Henderson is a California iconoclast, a rugged individualist who honed his ideas over a 20-year period, then found himself stonewalled when he tried to get them published. He solved the problem by committing his book—all 450 pages of it—to disk. He distributes the disk as shareware for a \$5 registration fee. If you like it, you can buy the printed version for \$39.50. Henderson's reader program is nothing to write home about; it simply scrolls the chapters by the screenful. Although it uses line-drawing characters and various colors for emphasis, it's devoid of hypertext features, an electronic index, or any of the niceties you might hope for. But then it just might change your life. (Scientific Specialists: 714-866-6263.)

SOPHISTICATED SHAREWARE

One of the neatest shareware programs I've seen in a while has the whimsical name *Hi, Finance!* Don't sell this one short. Behind the cute icons lurks a powerful set of financial calculators and programs. This one uses Windows to the max, with spreadsheetlike input cells, graphical displays, and a host of handy tools.

Frankly, I was expecting yet another clone of a Hewlett-Packard financial calculator and was delighted to find a bunch of truly useful, truly easy-to-use tools for solving life's tougher math problems. How much money do you want for retirement? A lump sum or annual income? *Hi, Finance!* will tell you how much you need to start setting aside and will draw you a graph as well. Ditto for college funds for your kids, the effect of inflation on your savings, and more. It has special features for figuring profit margins, gross price margins, and break-evens. The centerpiece, however, is a neat little investment analysis calculator that lets you make assumptions about interest rates, inflation, and other factors to show your overall financial health. I hate having to think about this stuff, yet I was getting a kick out of using the program. Better still, my seatmate on the plane was a financial heavyweight from Merrill Lynch. His comment? "Hey, I could use this, too!"

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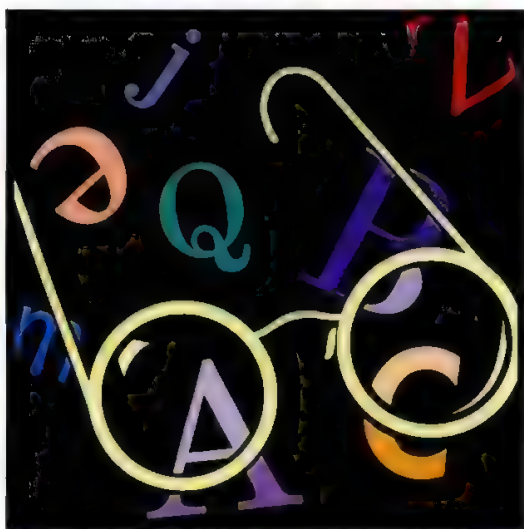
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External Cache Option	Yes	No	Yes (64K or 256K)
Video Memory	1MB	1MB	512K
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Local Bus Slots	Yes (2)	No	No
Eight Expansion Slots	Yes	No (6)	No (6)
On-board SCSI option	Yes	No	No
Two cooling fans	Yes	No	No
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Optional Hard Drives	14	9	3
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John C. Dvorak

The Perfect Portable?

Close, but no cigar. If any recently introduced machine can be dubbed a subnotebook—a dubious new moniker—then it has to be the new Gateway 2000 HandBook. The HandBook is a 286-based combination notebook/palmtop. It's too small

to be a classic notebook such as the TI TravelMate 2000, and too big to be dubbed a palmtop such as the Poqet PC or the HP 95XL. The size is right in the middle, and it has the advantages of both categories without size-related disadvantages. Unfortunately, the engineer who designed the HandBook added some disadvantages of his own.

Let's look at the advantages. First of all, the machine is compact without being so small that you can't touch type on it. It's about 9.8 inches wide by 6 inches deep, and it weighs only 2.7 pounds (with power supply)! This is the perfect machine to toss into a suitcase or to keep in the car glove box. I was very impressed by the hard plastic case, which resists pressure on the back of the LCD. I've been paranoid about breaking an LCD screen ever since I once broke one from the outside! Even my all-time favorite—the TravelMate 2000—has a flimsy case that doesn't protect the LCD well enough from the unavoidable knocks and bruises these machines must endure. The HandBook won't have this problem. Also note that this machine has a cool hardware-based security password system. Great idea. It has no floppy disk drive, but contains a 2.5-inch 40MB hard

disk. It also comes with LapLink for hookup to a desktop PC. Finally, the HandBook has a software continuation feature. This enables you to turn the machine off when you're in the middle of a word processing session. When you turn it back on, you're prebooted right back to where you turned off the switch. Very cool.

This little computer defines a whole new category and a future direction of portable computing.

ONE STEP AHEAD, ONE BACK
Now if they'd only get it right! First of all, the ma-

chine uses the archaic double scan CGA for its display. I look at this and think back to the old Zenith 181. The screen has the same weird blue color and old-fashioned CGA display that is a joke in 1992. At least it's backlit! For entertainment, I like to play video poker on my laptop during long air flights. Do I now have to research old CGA programs to do this? The CGA display was introduced over ten years ago. Does Gateway really expect users to be satisfied with the standards set by old technology? It's ludicrous to use it now.

A few major complaints about the HandBook: There is no built-in modem or minislot for a modem. Why? The often-used backslash key is buried on a mini-key in the lower corner. The preposterous placement of this key actually made me laugh. The machine's peculiar BIOS from Chips & Technologies locks up Telix, the otherwise ultrareliable telecommunications program. In all my years of using Telix, it has only locked up once before—on a Poqet. Maybe it doesn't like palmtops? I had a machine a few years ago with a BIOS from Chips & Technologies. It gave me a lot of grief and wouldn't install the then new Windows 3.0. Interestingly enough, the HandBook runs Windows 3.0 (an unadvertised feature), but locks up with 3.1.

The HandBook comes bundled with Microsoft PC Works, a downright embarrassing and awkward collection of decidedly mediocre programs. The old PFS: First Choice integrated collection was far superior to this stuff. Personally, I'd erase PC Works and find something else to replace it. In fact, that's the first thing I did.

Having made all these criticisms, I have to admit that Gateway has the right idea with this machine. Users considering a super-lightweight PC should take a long look at the HandBook.



The Gateway 2000 HandBook defines a future direction of computing. Now if they could only get it right!

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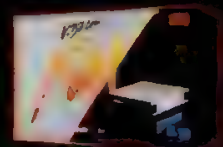
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John C. Dvorak Inside Track

As Microsoft approaches **3 billion dollars** in software sales, it looks back on an incredible growth rate. It's this growth rate that keeps the price of the stock high with a high price/earnings ratio. Microsoft knows that it cannot forever keep up this pace since there is no such thing as **infinite sales**. Still, new avenues must be explored. The most amusing is Microsoft's intention of putting Windows in ROM so that **Windows** can be run on a variety of home appliances. I've heard of fuzzy logic for appliances, but this is ridiculous. Actually, National Semiconductor has some fuzzy-logic controllers for appliances, which I assume will compete with Microsoft for the controller business.

I suppose it's interesting to imagine a washing machine with a graphics control panel somehow coordinated by Windows. Personally, I feel that most appliances need only an on/off device. It's called a switch. **I guess on-and-off is dead!** It's good to know that our software industry is doing what it can to **complicate the activities of day-to-day life**. Next, the washing machine will be talking to us. "Put in more soap! Are you crazy?!"

The Memory of MSX Lingers Dept.: On another **Microsoft** front, it appears that Microsoft is finally **getting into bed** with its Redmond-based neighbor, Nintendo! A number of secret projects between the two companies are under way. **Nintendo** has long been toying with the idea that it can enter the home computer market by adding a keyboard option to the basic Nintendo machine. It wants Microsoft to supply a suite of applications to go along with it. You might also see Microsoft's Flight Simulator running on Nintendo machines someday soon.

Aside of the Week: When people ask me which will be the **big** computer companies in the year 2000, I'll say IBM, Apple, and Nintendo or Sega! This always gets an oooh and an ahhh from the audience. Try it.

Genuinely Interesting Software Dept.: There has been plenty of chitchat over the past year about how nifty Personics' Laptop UltraVision is. It gives you a big square cursor and a variety of character mode fonts to substitute for the **ugly default** that comes with your VGA card. If reviewers had had a Toshiba 4400SXC to play with, they would have discovered another use for this package. With many new color LCDs, the pixel map **does not correspond** to that of a normal monitor. While Windows and OS/2 desktops fill up the whole screen, DOS or a virtual DOS

*Which will be the big
computer companies in
the year 2000? IBM,
Apple, and Nintendo
or Sega! A number
of secret projects
between Microsoft and
Nintendo are
underway.*

machine in OS/2 does not. What you end up with is an unused blank area above and below the part of the screen displaying the DOS session. Laptop UltraVision for \$69.95 fixes that anomaly. Highly recommended. Call Personics at 508-658-0040 for more information.

Is This Ad Kind of Nutty?

Dept.: Oracle Corp. has an interesting new ad for its database product line. The ad highlights a bunch of executives, including John Sculley and Bill Gates, who are quoted to sound as though they are **extolling the virtues** of Oracle. Earth to Bill, earth to Bill: You have a database that Microsoft sells. It's called FoxPro. Same for Sculley. The Apple software company (Claris) makes a DBMS. **Kudos** to

the super salesmen at Oracle for getting its competitors to endorse the competition!

Book of the Month Dept.: If you are in the upgrading mood and you have a 286 (or worse) **clunker** that needs a boost, then get *New Life for Old PCs*, by Alfred E. Poor (Business One Irwin, 708-206-2700, \$29.95, 223 pages with disk). Poor is a *PC Magazine* contributing editor, and in this book he outlines key strategies and specific recommendations for upgrading your machines. **Good reading** for the company saddled with old dogs. Highly recommended.

We Get Letters Dept.: Daniel Rosenbaum writes: *In your Inside Track of September 15, 1992, you said that Microsoft's been out of the hardware business (except for the Microsoft Mouse) since its CP/M card for the Apple II. Assuming you're counting the mouse bus adapter as part of the mouse family, how could you have forgotten the ill-fated Mach 10 and Mach 20 accelerator cards, which had all the utility and upgrade path of an Apple III?*

How could I forget, indeed! Those cards were Microsoft's early attempt to push the market in the direction of Windows and should have been **interpreted as an omen**, not a product.

When Will It End Dept.: Apple is in the news again with a new programming system you can be sure people will copy. Well, they won't copy the language, they'll copy the **newest buzzword: OODL**—Object-Oriented Dynamic Language. As opposed to a non-object-oriented dynamic language or an object-oriented nondynamic language. Nobody really explains what a dynamic language does or why anyone would want one. You can expect a lot of confusing reasons why it is better than the last buzzword. Add this term to *paradigm shift*, *client/server*, *scalable*, and *mission-critical*. If you catch anyone using these terms, they probably **don't** know what they're talking about. □



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Jim Seymour

Power Graphing in the Windows Era

In the Windows era, it's a given that reasonably good graphing and charting modules are found in all the GUI spreadsheet programs. And it's a fact of life that the graphing packages we once relied on have been supplanted by much more elabo-

rate "presentation packages," at least for those who want to work within a native Windows program, not shell out to DOS. These presentation-oriented apps are full of slide-show razzle-dazzle, and soon enough will be full of desktop video razzle-dazzle, as the notion of moving images edges out the already anachronistic *ker-chunk ker-chunk* of PC slide shows.

Unfortunately, the ersatz fades and wipes of these slide-show packages are often much less useful and important than powerful, comprehensive graphing. But in this Windows era, when it sometimes seems that the medium's message is what really counts, is there still a market for unabashed power-graphing programs?

Some venture capitalists and software publishers apparently think so, for we've recently seen the introduction of two no-holds-barred muscle graphing programs: 3-D Visions' Stanford Graphics and DeltaPoint's Delta-Graph Professional.

I think so, too. But I'm not so sure the die for the future of complex graphing and charting is cast by either of these packages.

I don't want my enthusiasm for powerful graphing packages to sound as if I'm knocking the more presentation-oriented graphics packages. I use them, too, and love the style and consistency they bring to presentations.

With names like Persuasion, PowerPoint, Charisma, and Hollywood, these packages make it impossible to miss their intent: to sell people on your point of view. (Lotus's Freelance Graphics for Windows belongs on the list, too—and may be the best of the lot—but its name hardly conjures up the images of killer presentations evoked by the others.)

It's true, certainly, that "word charts" (such as

bullet lists) rather than numeric graphs constitute the majority of most presentations, so it's appropriate that these presentation packages emphasize flexibility and ease of use in managing text. From text outliners to on-screen representations of yellow legal pads, these programs try to reassure and coddle the great majority of us who are more comfortable with words than numbers. I wouldn't call the graphing modules in these packages afterthoughts, but it's clear that they are more nearly state-of-the-art *easy* than state-of-the-art *powerful*. They're missing too many graph types, and all have limited flexibility in their graphing options.

That leaves those of us who have to integrate persuasive numeric data as well as persuasive text into our presentations high and dry a good deal of the time. Scientists, for example, who may need to plot hundreds or thousands of data points in a series to get a smooth, accurate curve of their results, often find presentation-oriented packages' graphing features insufficient.

If you're a businessperson and you rely on multiple 100% bars, or on 100% bars exploded out of pie-chart wedges, or on the invaluable bubble chart, you're likely to have to turn elsewhere for a graphing program—even if in the end you export that graphing program's output back into, say, a PowerPoint or Freelance Graphics slide series.

Thus, such packages as Stanford Graphics and DeltaGraph Pro play an important role in preparing presentations. (The publishers of both of them will scream that their programs, too, have slide-show modules built in, and therefore should be considered full-fledged presentation packages as well as power tools for creating complex graphs. Yes, both programs do have presentation routines, but they're not up to the standard of



What we still need: graphing apps that plot highly complex numerical data without trashing Windows.

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Jim Seymour

the presentation tools in such programs as Persuasion or PowerPoint. I think of Stanford and DeltaGraph as graphing programs first, and as presentation packages only for the very occasional and undemanding presenter.)

Both packages have a rich array of graph types; better still, both allow extensive manipulation and analysis of graphed data.

Unfortunately, both also have odd interfaces and working procedures, are woefully difficult to use, and are so unstable in the Windows environment that it's hard to recommend either.

Indeed, I can't remember any programs I have loved and hated as much as Stanford and DeltaGraph. The only possibility is PageMaker in its first, horribly buggy release for Windows: it was nearly universally (and justly) called "RageMaker," even among its most ardent users.

With both Stanford (including its new Version 2.0 release) and DeltaGraph, I get a steady stream of General Protection Fault failures. GPFs are, of course, Windows 3.1's data-losing, program-dumping successors to Win 3.0's infamous Unrecoverable Application Errors.

This isn't on off-brand PCs with little memory, but on clean, name-brand PCs with lots of free memory.

Yet I still use both of the programs. (Maybe I should look on the GPFs as a character-building feature of the two packages: they do teach you to save your work frequently.)

Why? Because both deliver results I simply can't find in any other PC programs. When, for example, I need to prepare a chart ranking several competitive products by price, relative capability, and respective market share, I turn to Stanford's bubble-chart routine. When I need to show several groups' progress over time through several variables, I turn to DeltaGraph's spider-graph module.

I don't rely on hard-to-use, buggy programs because I like them; I rely on them because I need what they—and only they—can do.

So yes, you bet: I think there's a real, sizable, and continuing market for power-graphing programs, quite apart from the larger, more mainstream presentation-programs category. And I admire greatly what 3-D Visions and DeltaPoint have packed into their products.

Now if only they could take a few things out...like the bugs. □

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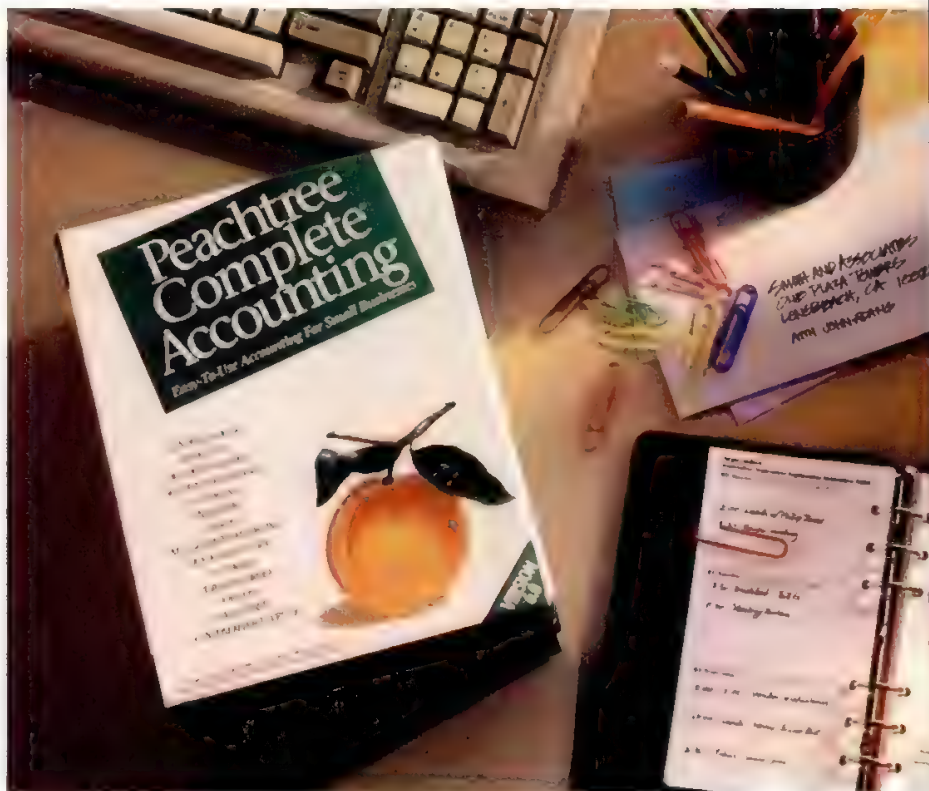
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THE INTELLIGENCE OF THE 386SL CHIRP

Intel designed the new 386SL processor specifically for notebooks. And they were right on target! You'll find that this sharp new processor extends your battery life significantly because it's intelligent enough to power-down the memory, disks, modem, and more when they're not in use. It's perfect for the stop-and-go computing that you're likely to do every day.

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William F. Zachmann

The Price Wars Are Over

Sharp drops in personal computer prices in 1992 have pleased users, who now spend less and get more. But beware the temptation to assume that this trend will last long. It won't. Those who hold off PC purchases in hopes of further dramatic

price declines are likely to be disappointed. It may make more sense to "get while the getting is good" and take advantage of recent low prices. We may even see prices rise somewhat over the next year or so.

Oh, sure, costs per MIPS and per megabyte will decline in the long term, but special factors have recently driven prices downward at a rate that will be hard to sustain.

The three primary causes for the price declines are pyramiding competition in the mail-order PC market, the breakdown of authorized dealer distribution channels, and Intel's efforts to deal with challenges both from X86 clones and RISC architectures from other sources.

By "pyramiding" competition, I mean what almost amounts to exponential growth in the number of new and relatively unknown IBM-compatible PC "manufacturers." I put the word in quotes because many of these vendors might better be characterized as "assemblers."

The assemblers simply purchase system and controller boards, cases, power supplies, disks, and so forth from the original manufacturers. These vendors don't design much beyond their logos, their stationery, and their ads. They are far more imitative than they are innovative. (Others might be qualified as "specifiers," who do some design but also specify certain components for those designs.)

As success of the early players in this market is imitated by others who are then imitated by yet others (and so forth), though, profit margins are shaved ever thinner by good, old-fashioned capitalist competition. Prices are driven downward, but a serious shakeout is inevitable.

We've also witnessed an almost-total breakdown of traditional au-

thorized-dealer distribution channels used by top-tier manufacturers such as IBM, Apple and Compaq. Once-valuable dealer medallions, which signify major vendor authorization, are now all but worthless. No one even talks about the gray market anymore. Digital Equipment Corp. is using the mail-order channel; IBM and Compaq have recently made serious price capitulations. These companies have given up on the type of distribution that dominated the industry in the 1980s.

The third key element in recent price declines is Intel's strategy of proliferating different versions of its 386 and 486 microprocessors and dropping their prices in order to shake off competition from AMD, Cyrix, and manufacturers of various RISC processors. System vendors have quickly passed Intel's lowered prices.

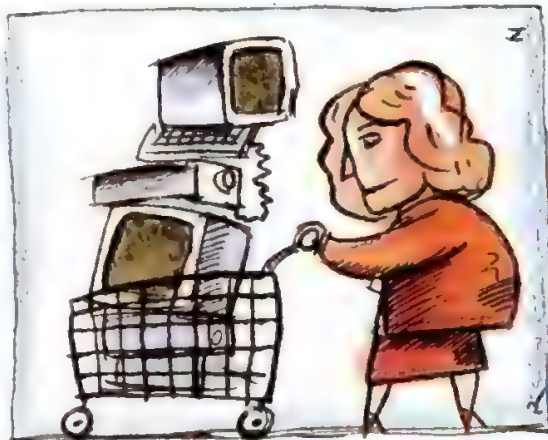
These factors, together, have led to the sharp price declines of the past six to nine months.

The problem, at least from the happy buyer's point of view, is that the trend cannot continue much longer. The number of system vendors cannot grow more rapidly than the number of new users indefinitely.

Lower prices from the top-tier vendors further put the squeeze on low-margin system assemblers. Intel is

also unlikely to cut prices further in the short term. Intel is likely to introduce newer, higher performance processors initially at premium prices in 1993, but maintain steady prices on older chips.

The bottom line is that a year from now there are likely to be many fewer system vendors than there are today. With fewer vendors, the market should be significantly less competitive. Today's intense competition and low profit margins will lead to a more profitable market but less intense competition and relatively higher prices next year. □



If you're thinking about buying that monster PC, go for it. Prices are probably as low as they'll ever be.

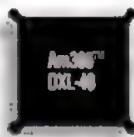


The Official Flag Of The

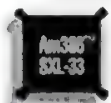
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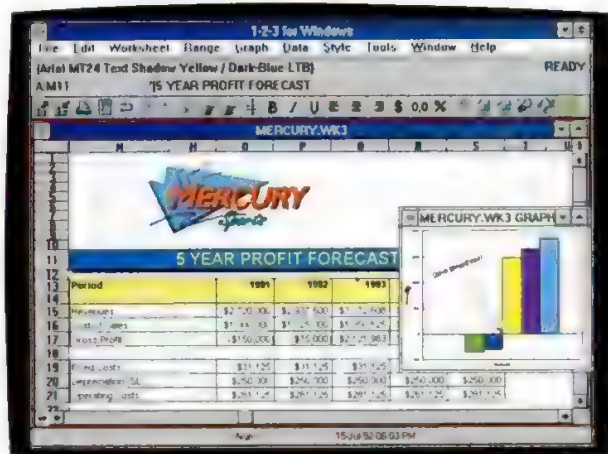
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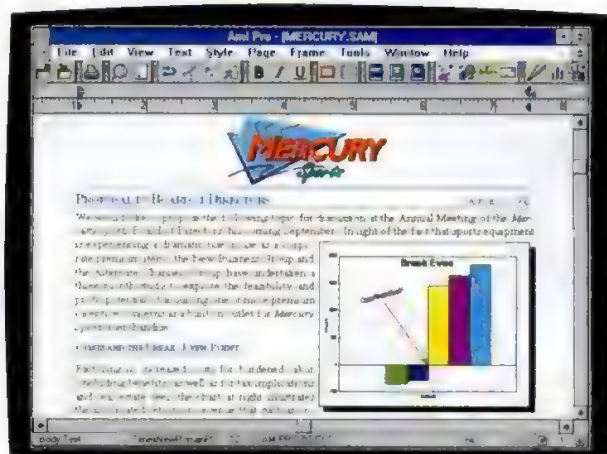
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Compared to Lotus Microsoft Office look



1-2-3 for Windows Release 1.1, the ideal choice for 1-2-3 for DOS users moving to Windows, now includes SmartPak, a disk which includes over 25 new features and usability enhancements.



The new Ami Pro 3.0 has been hailed as the best word processor for Windows, with new features that make it more powerful and easier to learn and use than Microsoft Word for Windows.

It's true. When you evaluate our complete solution for Windows™ desktops and then look at theirs, you'll see why ours is a better business choice.

Of course, both SmartSuite™ and Microsoft® Office include full-featured products. But SmartSuite has been recently updated to include 1-2-3® Release 1.1 with SmartPak™ and the newly released Ami Pro® 3.0, as well as Freelance Graphics® and cc:Mail™.

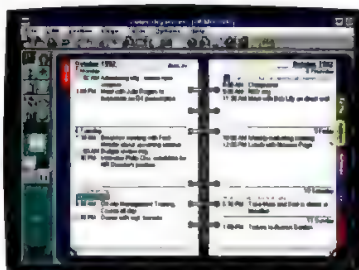
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What's more, SmartSuite delivers some truly unique integration capabilities that aren't possible with Office. All four SmartSuite products,

for example, share data, text and graphs between each application smoothly and seamlessly. So when an outline produced in Ami Pro is imported to Freelance Graphics, it's automatically converted into a Freelance Graphics outline and full-slide presentation. And a 1-2-3 graph exported to Freelance Graphics will arrive, fully editable.

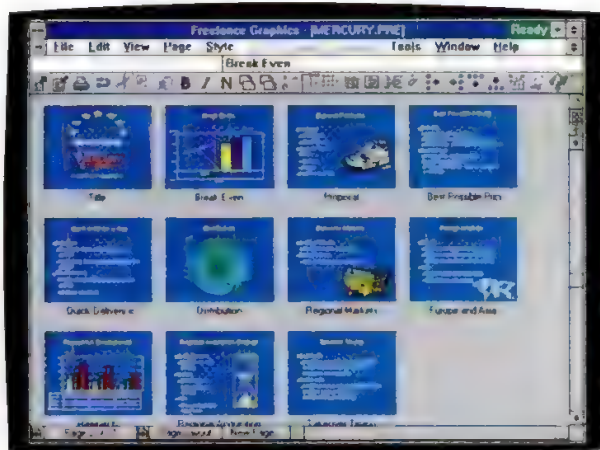
You can even move quickly between SmartSuite applications just by clicking



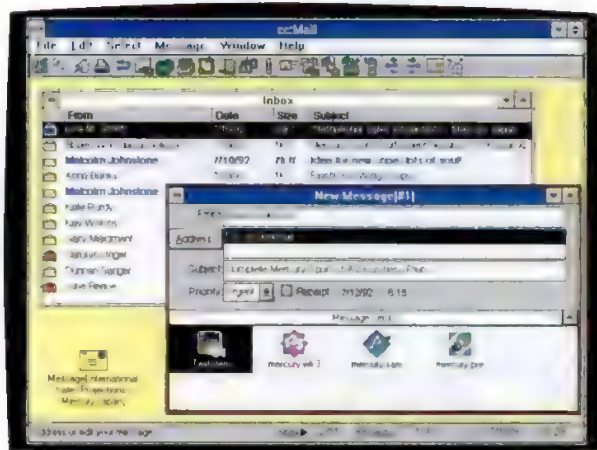
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Award-winning Freelance Graphics is the easiest, fastest way to create a stunning presentation. It includes QuickStart, an on-line tutorial, and SmartMasters™ which automatically manage the design of your presentation for you.



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the icon of the application you want to open.

Better still, all SmartSuite applications are mail-enabled. So you can use cc:Mail to send "live" documents from within each application. Office, on the other hand, requires you to install and use an optional macro with Microsoft Mail 3.0.

Why is now the best time to buy Lotus SmartSuite instead of Microsoft Office?

For one thing, you just can't beat the total value. In fact, for a limited time,* when you buy

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DOWN SIZ I N G N O T E B O O K P C S

The Incredible Shrinking Subnotebook

by Christopher Barr

Pull out your portable and study its size, weight, and all the odds and ends that go with it. If you've purchased wisely in the last three years, you probably have a Microsoft Windows-capable laptop laying there, with a travel weight somewhere around 10 pounds. Now think about how you use it. Do you take it on the road, simply shuttle it between home and office, or both?

If you're like most portable users, your portable computer probably holds three essential applications (communications, spreadsheet, and word processing) in addition to file-transfer software; these are all on a hard disk that is probably dangerously close to reaching its capacity.

Now imagine a smaller, slimmer portable with all the capabilities and features of your 10-pound wonder. Not only does it have a larger hard disk, it also comes with a longer-lasting battery at half the weight. You've just visualized a new generation of notebook computers: the subnotebook. And by the time you read this, the first of its kind

will be working on the road, forever changing the shape of portable computing.

Subnotebooks, like the new systems from Dell Computer Corp. and Gateway 2000, occupy the high end of the product category, between palmtops and full-fledged notebooks. Hand-held organizers, like the Casio B.O.S.S. and the Sharp Wizard, hold down the low end on both cost and functionality in this emerging class of portables.

Next up are the palmtops, such as Hewlett-Packard's HP 95LX, The Poqet PC, and the Zeos Pocket PC, which give you DOS-to-go in an inexpensive and small box. These machines come equipped with even smaller screens, finger-cramping keyboards, and underpowered processors, which means that they are strictly supporting players to full-featured portables and desk-bound computer systems.

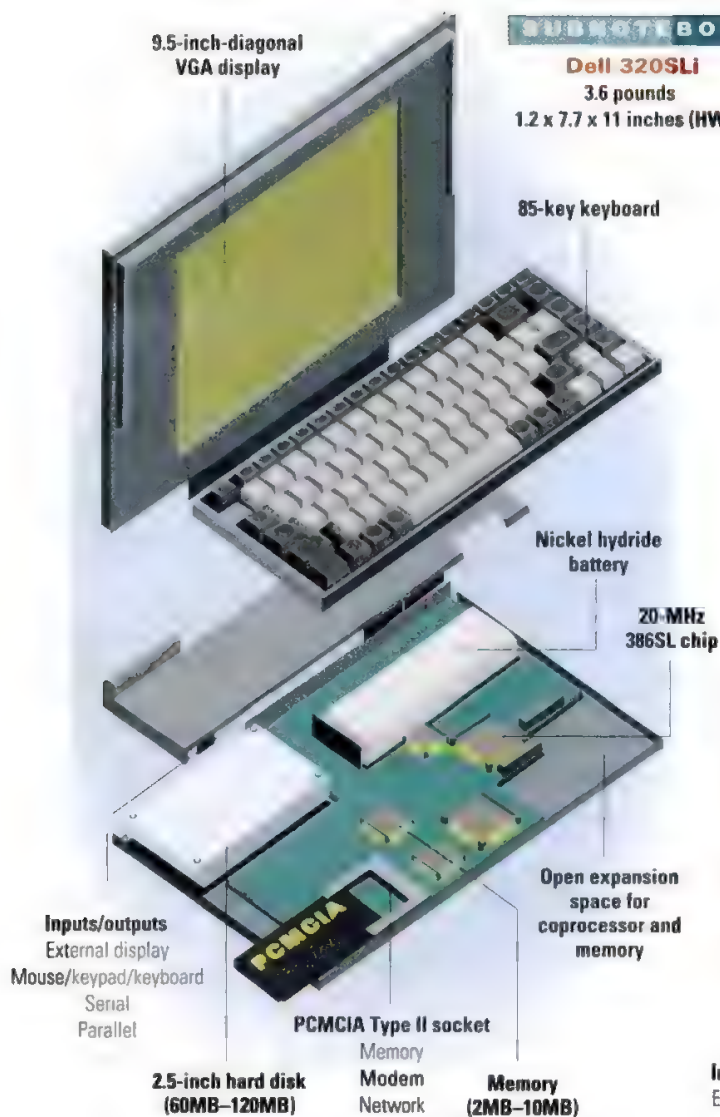
Subnotebooks are capable of performing both lead and supporting portable roles. Notebook replacements, the most powerful subnotebooks of this class, will each weigh between 2 and 4 pounds and have an 8.5- by 11-inch foot-

Breakthrough technologies in processors, power supplies, interface standards, and mass storage come together to create a new class of portables.

SUBNOTEBOOK

Dell 320SLi

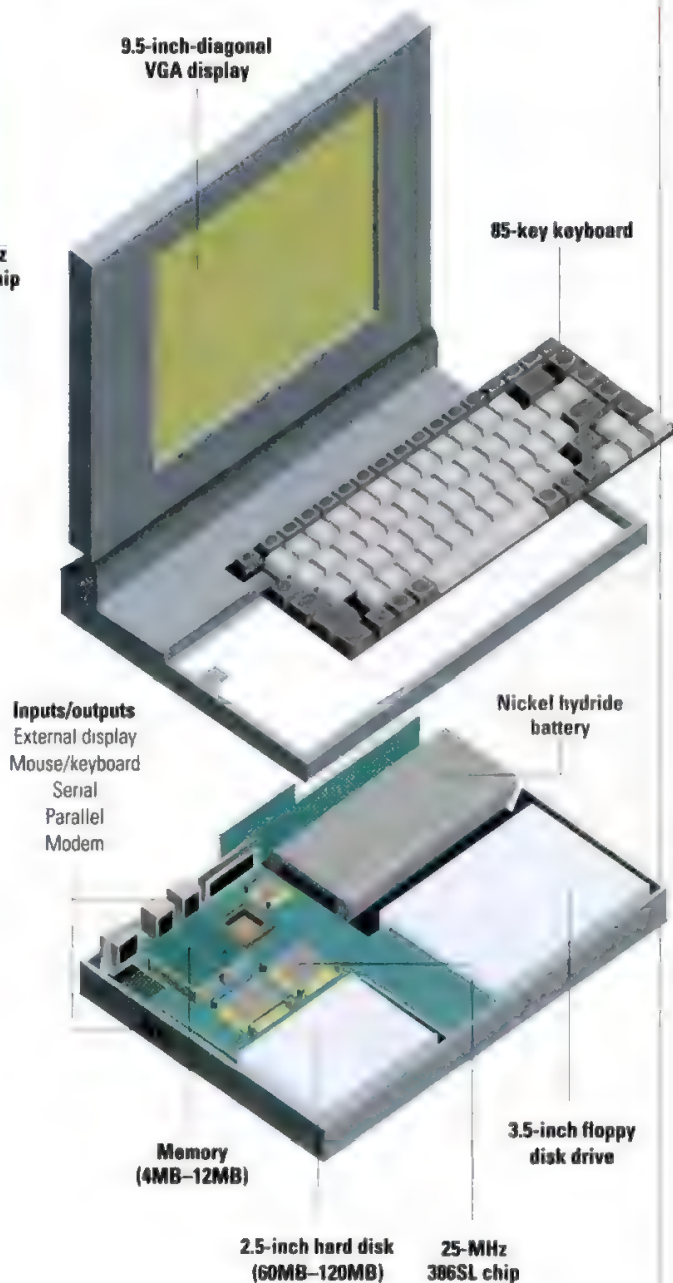
3.6 pounds
12 x 7.7 x 11 inches (HWD)



NOTEBOOK

Dell System 325N

6.4 pounds
2 x 11 x 8.5 inches (HWD)



PALMTOP

HP 95LX

0.6 pounds
1 x 6.3 x 3.4 inches (HWD)



HIGHLIGHTS

Subnotebook PCs

SUBNOTEBOOK PCs weighing 2 to 4 pounds provide most of the functionality of notebook PCs. They come with compressed keyboards, an on-board hard disk and a PCMCIA slot, external floppy disk drives, and a screen that may or may not be illuminated.

CPUs FROM AMD (the Am386SXL), Cyrix (the Cx486SLC), and Intel (the 386SL and 486SL) have power-conservation features built-in and are evolving from 5-volt to 3.3-volt operation. Chips & Technologies saves space by putting the CPU, system logic, video controller, and memory interface on a single chip.

BATTERY LIFE will improve with 3.3-volt parts. The CPU, system logic, video controller, and memory benefit most. The display illumination and hard disk, which draw two-thirds of the system's power, benefit least.

HARD DISKS are downsizing to a thinner 2.5, 1.8, and eventually 1.3 inches.

Currently a 1.8-inch unit has only a 40MB capacity, compared with a 2.5-inch hard disk's 160MB.

PCMCIA slots will be used for memory, modems, and network cards. And 20MB flash memory PCMCIA cards provide a virtually indestructible alternative to the hard disk.

COMMUNICATIONS is the least developed and most frustrating part of subnotebook technology. Options include PCMCIA modems (which just became capable of 14,400 bps), cellular (which is still unreliable) and packet radio for two-way data communications, and paging devices for one-way broadcasts.

DELL AND GATEWAY are the first vendors with subnotebooks. The Dell 320SLi is a near notebook sans a floppy disk drive and display illumination. The Gateway 2000 HandBook is much smaller, with severe CPU and display constraints.

print or smaller, and a slimmed-down height of around an inch.

Typically, the QWERTY-style keyboards will have compressed key spacing, but you will still be able to touch-type comfortably on them. Reflective VGA screens will be the rule for the first generation of systems that will reach the market, but you can expect backlit panels with VGA resolution to appear on second-generation models.

DOS and Microsoft Windows will be the primary operating environments, while processing power will be generally supplied by low-voltage 386-compatible CPUs. Mass storage will come in the form of miniature hard disks holding 60MB of memory or more. PCMCIA slots devoted to alternate storage on flash-memory cards, along with modem communications hardware, will be key components of nearly all of these systems.

Meanwhile, some manufacturers will produce lightweight thin-slice external

floppy disk drives as standard options for those who can't live without 3.5-inch-disk file transfers.

For standard on-the-road computing tasks, subnotebooks will perform as ably as any notebook on the market, if not more efficiently. Before buying one, though, you will have to consider two important questions: Will the subnotebook be your only computer, and what is the minimum portable computing power you need?

You will have to weigh the practical application against the limits of the platform. Some subnotebooks will achieve

their remarkable size and portability by using 8088/8086-compatible processors, low-resolution screens, highly compressed keyboards, and nonstandard or minimal I/O interfaces.

Since many subnotebooks are still under development, we outline the technologies at work in the production of these featherweight portables. Our coverage includes

- power-saving, low-voltage CPUs and chip sets;
- new battery technologies and power-management features;
- low-power-drain display technologies;
- compressed keyboard designs and alternate input/output devices;
- miniature hard disks and flash-memory storage;
- breakthrough PCMCIA peripherals and devices;
- communications and wireless networking.

We also examine the first subnotebooks to arrive on the market: the Dell 320SLi and the Gateway 2000 HandBook.

In coming issues, you will find much of the technology examined here integrated on a variety of highly portable platforms. Look for our overview of eight pen-based portables and the latest pen-centric operating systems in the next issue of *PC Magazine* (November 10, 1992). In addition, a year-end roundup (December 22, 1992) will cover more than 70 notebook PCs.

As subnotebooks gain their place in the market, keep an eye out for *PC Magazine's* future comparative reviews and Editors' Choice picks, and *PC Magazine Labs'* test results. (There is no Editors' Choice selection in this issue because the Dell and Gateway systems were not shipping as of our deadline.) You can use this overview story to help understand the technology driving the next generation of subnotebook, notebook, and pen PCs.

For standard portable computing, subnotebooks will perform as ably as notebooks, if not more efficiently.

Our Contributors: CHRISTOPHER BARR is a senior editor of *PC Magazine*. JEFF GREENBERG is a computer consultant who served for four years as manager of strategic marketing at Toshiba America. ALAN A. REITER is group executive editor of *Mobile Data Report*, a biweekly newsletter covering wireless data communications.

SUBNOTEBOOK CPUs

Pinning Down Power

New chips balance computing power and power drain.

Low-drain processors are one critical element in downsizing notebook designs, and their conservation features are due to some remarkable technological advances. These chips can't yet match the fast SX and DX microprocessors running the best notebooks today, but you do get enough 32-bit power to run current applications.

The past year has seen the rise of the first wave of processors that conserve power by managing hungry peripherals, such as screens, hard disks, and keyboards. The built-in power efficiency of new chip designs even extends to enabling and disabling memory and CPU functions.

Power-conserving CPUs for subnotebooks fall into one of two categories: 386-compatible and single-chip integrated logic. AMD and Intel make low-power 386s in 5 and 3.3 volts, while Cyrix is producing 3.3-volt hybrid Cx486SLC chips along with its 5-volt SX-style (SLC) and DX-style (DLC) chips. By year's end, Intel should release a 3.3-volt 486SL.

Drawing approximately 25 percent less power than 5-volt chips, 3.3-volt processors are an obvious choice for portables of all sizes. The new Dell 320SLi subnotebook uses Intel's 5-volt 20-MHz 386SL, which, like other 5- and 3.3-volt processors in the SL line, gives it standard 386SX performance. Unlike standard chips, though, the SL line is designed to provide power-saving hardware hooks for shutting down system peripherals to maximize power savings. Manufacturers know that the CPU and system logic, video controller, and memory show a dramatic drop in power consumption in the migration from 5-volt to 3.3-volt systems. Because of this, they establish a compo-

nent shut-down hierarchy where screen and disk activity is disabled before the chips, since these two components draw up to 70 percent of the available power.

Chips & Technologies' PC/Chip, which debuts in the Gateway 2000 HandBook, is the prime example of the sys-



The C&T PC/Chip and Intel SL chip set.

tem-on-a-chip variety. This product is a compact 160-pin device that combines an 8088-compatible CPU, system logic, CGA video, RAM, and a memory-card interface on a single chip. Built for low-power operation, the PC/Chip runs at 14 MHz and offers 16-bit real-

mode processing. In other words, it has all the performance of a 286. Chips & Technologies clearly trades raw processing power for low-cost integration, but that means the PC/Chip sells for about \$35 in 1,000-piece quantities. By comparison, in 1,000-piece quantities the 20-MHz 386SL from Intel lists

for \$48 without a cache controller.

Consumers and system manufacturers will settle for less computing power only as long as the cost and power-saving benefits outweigh the deficits of working with processors that are two and three generations behind today's standards. Meanwhile, chip developers are trying to play catch-up with the inevitable. Chips & Technologies already plans to release the next PC/Chip, called PC/Chip+, with embedded VGA, and Intel closed a deal with VLSI Technology to produce a 32-bit low-voltage single-chip device with VGA based on Intel's 386 code.

Hand-held and pocket PC makers are sticking with the low end for now. NEC's V20 and V30 CPUs are popular choices. Hewlett-Packard uses the 9.5-MHz V20 8086-compatible chip in its HP 95LX, as does GRiD Systems in its PalmPAD. Both the Psion Series 3 palmtop and the new \$595 Zeos Pocket PC use the underpowered XT-compatible NEC V30 processor.

When personal digital assistants (PDAs) arrive on the market next year in the form of Apple's Newton and unnamed systems from EO Computer and General Magic, they will introduce entirely new CPUs, such as Advanced RISC Machines' ARM610 and AT&T's Hobbit chip. The ARM and Hobbit CPUs are tiny, low-powered, low-cost RISC chips with full 32-bit processing, but they will not support DOS or Microsoft Windows.—Christopher Barr

SUBNOTEBOOK BATTERIES, POWER MANAGEMENT

Packing Power

Improved portable batteries fight power drain.

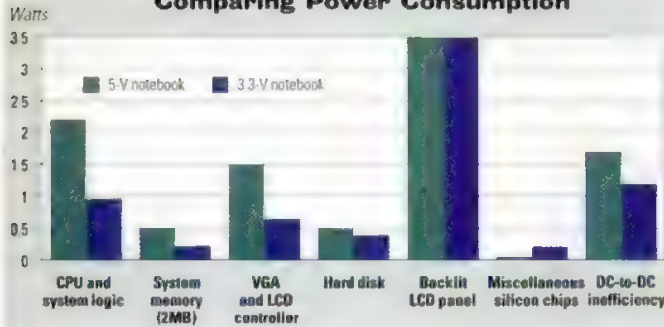
Despite advances in rechargeable battery technology, there is one inescapable reality with portables. Sooner or later you have to find a power socket and recharge the system.

Manufacturers have stretched charging cycles significantly by moving to increasingly efficient and longer-lasting power cells. Now they are integrating low-power components into computers of all classes, but batteries still run out of power eventually.

Nickel cadmium batteries are the

most common portable energy source today. They replaced alkaline batteries on the earliest portables and have served them well over the years. Nickel cadmium batteries are incapable of accepting a full charge, though. Some experts attribute this to a so-called memory effect, where many recharges of a partially depleted cell tend to cut its full-charge capacity over time. Others deny the existence and influence of the memory effect. At any rate, users know their portable cells never run as long as expected. And many of these vendors have moved on

5-Volt and 3.3-Volt Notebooks:
Comparing Power Consumption



As manufacturers move from 5-volt to 3.3-volt systems, you can expect power consumption to drop dramatically. The CPU, system logic, video controller, and memory will show the most power savings. Backlit displays are the wildcard because the first low-voltage LCDs will not be available until the end of the year.

to the next generation of power cells.

Nickel hydride cells are the power source of choice today, and they have one great advantage over standard nickel cadmium batteries: You can partially recharge a nickel hydride-powered portable whenever and wherever it's convenient. What's more, these cells provide approximately 20 percent more energy per pound (energy density) than nickel cadmium packs. Though they cost more, nickel hydride cells are also environmentally safe, since they are significantly less toxic than cadmium-based cells.

Lithium ion batteries are the rechargeable cell of the future. Currently being developed and tested, lithium ion cells are projected to offer twice the energy density of nickel hydride batteries. Lithium-ion-powered portables will appear on the market late in 1993.

On the low-end, the Gateway 2000 HandBook, Hewlett-Packard HP 95LX, and Zeos Pocket PC are designed to operate on alkaline batteries. The Gateway subnotebook has optional rechargeable and disposable batteries. This is a feature that has obvious appeal for users and vendors alike: Alkaline batteries are available anywhere and are an easily replenished backup power source.

Alkaline batteries have their drawbacks, though. The first is price. A typical alkaline battery costs about 4 cents per watt hour. Nickel cadmium and nickel hydride cells cost 4.2 cents per watt hour, but these batteries can be recharged approximately 250 times; the figure is therefore less than 0.02 cents per watt hour over the lifetime of these cells. There-

fore, alkaline batteries are about 20 times as expensive to use as are rechargeable battery packs. An even larger drawback is that alkaline batteries lose voltage at a constant rate from about 1.6 volts to about 0.7 volts as they discharge. This means you're always running the risk of not having enough voltage to operate your portable if the system is loaded with partially discharged batteries. By comparison, nickel cadmium and nickel hydride batteries hold a specified voltage until it is almost completely discharged. Alkaline batteries are not kind to the environment, either. Fast discharge rates and easy disposability make these batteries a continuous source of long-lasting toxic waste.

To provide the hardware and software hooks needed by vendors to produce power-saving systems, Intel and Microsoft worked out a new specification called Advanced Power Management (APM) for use with battery-powered

portables. This specification lets manufacturers automatically shut down idle components and manage the system status from applications. Meanwhile, system designers are inventing ways to shut down components as quickly as possible. Using proprietary technology similar to APM, the Gateway automatically detects when parallel- or serial-port devices are attached. If no device is connected, it disables power to the inactive port. The Dell 320SLi takes a manual approach by enabling hotkeys that let you shut down selected components at will.

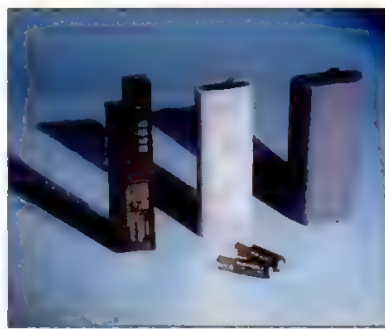
Decreased power consumption is the driving factor behind the migration from 5- to 3.3-volt systems. Theoretically, 3.3-volt use can reduce power consumption by up to 56 percent; however, many current components like backlit displays are no more efficient at lower voltages. Until pure 3.3-volt systems debut sometime in

1993, hybrid 3.3- and 5-volt systems that will soon be released should reduce operational power consumption by approximately 30 percent.

The ever-shrinking traces on integrated circuits demand 3.3-volt technology, too. As traces hundreds of times smaller than the

width of a human hair drop in size from 0.6 and 0.5 microns, they become too thin to contain 5 volts, making the development of 3.3-volt components critical.

—Jeff Greenberg



HandBook, Dell 320SLi, and Dell 325N batteries.

SUBNOTEBOOK DISPLAYS

Plugging a Power Drain

LCDs need optimal illumination and power conservation.

Just when it seemed like portable CGA displays were only a memory, Gateway 2000 trots out the Gateway 2000 HandBook, equipped with a double-scan 640-by-400 CGA panel. In contrast, Dell Computer Corp. uses the latest reflective-panel technology to display 640-by-480 VGA resolutions on its Dell 320SLi subnotebook. Each are radically different approaches to the same goal: smaller,

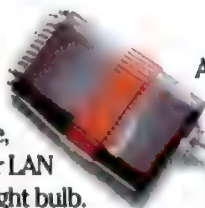
lighter displays that draw little or no battery power. Both approaches come with certain compromises in screen quality, though. Even more important, neither address the ghosting effects common to mature LCD technologies.

First, some background. A backlit panel drains the most power from a portable's battery—up to 30 percent. Since there is no way to reduce this consumption by lowering the voltage, manufactur-



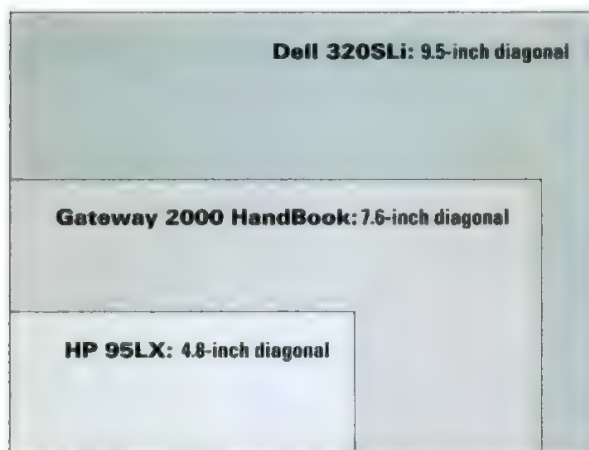
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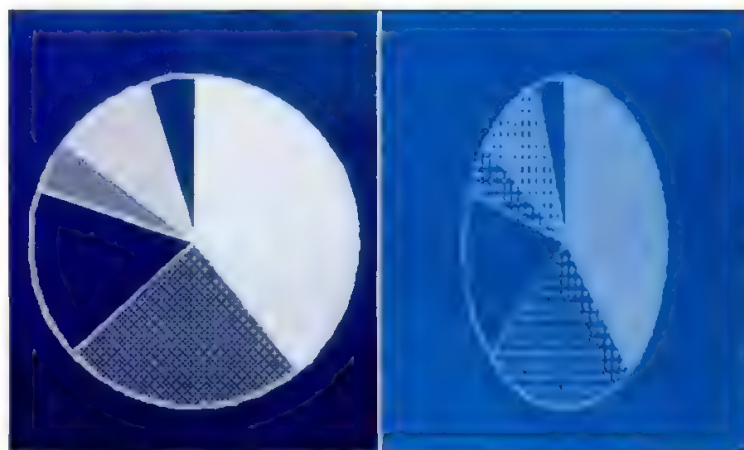


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Relative screen sizes: the HP 95LX, HandBook, and Dell 320SLi.



The Dell 320M (left), a notebook, has a better aspect ratio than the HandBook.

ers are turning to ingenious ways to reduce or eliminate backlit-panel power consumption.

To meet the demand for crisp, bright, black-and-white displays, manufacturers build compensation layers into their LCD panels. These layers convert the natural blue and white of the LCD screen to black and white, but they also increase the opacity of the screen—and the need for backlighting.

Gateway simply eliminates the compensation layers in its PC's LCD. By keeping the screen at its original blue and white, the amount of light that passes through the panel increases from 18 to 23 percent. This, in turn, lets the Gateway use a lower-power backlight that consumes only 1.5 watts instead of the 3.5 watts consumed by conventional backlit LCDs.

Dell eliminates the backlighting on its PC altogether. It uses high-contrast reflective screen technology, which effectively reduces the power draw from the display to an almost negligible 0.5 watts. Under normal lighting conditions, the reflective panel's 12-to-1 contrast ratio is the same as that of the first backlit screens and only slightly less than the 16-to-1 ratio on contemporary backlit LCD panels.

Backlit CGA and reflective VGA each trade something for its gains. The Gateway's display is small and readable but inadequate for graphics display. What's more, the 7.6-inch screen has a slightly distorting 4-to-3.2 aspect ratio. The Dell has a good-size 9.5-inch screen with a standard 4-to-3 aspect ratio, but its readability relies on the quality of the

ambient light source, while its dimensions require a larger subnotebook footprint.

More-advanced technologies, such as active- and passive-matrix displays, are not yet available for subnotebooks. An active-matrix color display, which can add from \$1,000 to \$2,000 to the cost of a full-featured notebook, is not practical or perhaps even necessary on a subnotebook. However, you can expect active- and passive-matrix black-and-white LCDs to start appearing on subnotebooks by the end of the year.

Transflective displays are a limited

screen option for subnotebooks. First used in the Zenith MinisPort in 1989 and most recently on the IBM ThinkPad pen-top, transflective LCDs can be backlit under low light levels and reflective under bright light. Unfortunately, the two screen elements are at odds: Backlighting reduces the screen's reflectivity, while the screen's reflective mirror reduces backlighting efficiency.

In the future, look for subnotebooks with active- and passive-matrix black-and-white displays. They offer good light transmission without the high cost that color active-matrix displays add.—JG

KEYBOARDS AND INPUT/OUTPUT

Squeeze Play

Portables keep getting smaller, but hands and I/O needs haven't.

A subnotebook's keyboard design and I/O capabilities clearly indicate its practical use. Subnotebooks with close to full notebook functionality have near-standard keyboards and I/O options. Hand-held units and pocket PCs have severely undersized keys, making them good only for note taking and simple data entry. They generally have one I/O port.

The keys on a standard desktop are spaced 19 millimeters (0.75 inches) apart from center to center, both horizontally and vertically. Historically, efforts to make keyboards smaller than the desktop standard aren't well accepted.

With subnotebooks, portable computer designers are torn between maintaining standard key spacing and making

the keyboard as small and functional as possible. The reduced keyboard sizes on the Dell 320SLi and Gateway 2000 HandBook are due to varied key spacings; the alphanumeric areas of the keyboard have near-standard spacing, but the accessory keys, which are not as often touch-typed, have a reduced key-cap size and spacing. Primary-key spacing on the Dell 320SLi is 18.2 millimeters (0.72 inches), while the Gateway 2000 HandBook's spacing is 17.8 mm (0.70 inches). There is a 16-mm (0.63-inch) space between their function, cursor, and dedicated Home, End, PgUp, and PgDn keys.

A difference in millimeters may seem insignificant, except when you put your fingers on the keyboard. The Dell is comfortable to touch-type on, while the Gate-

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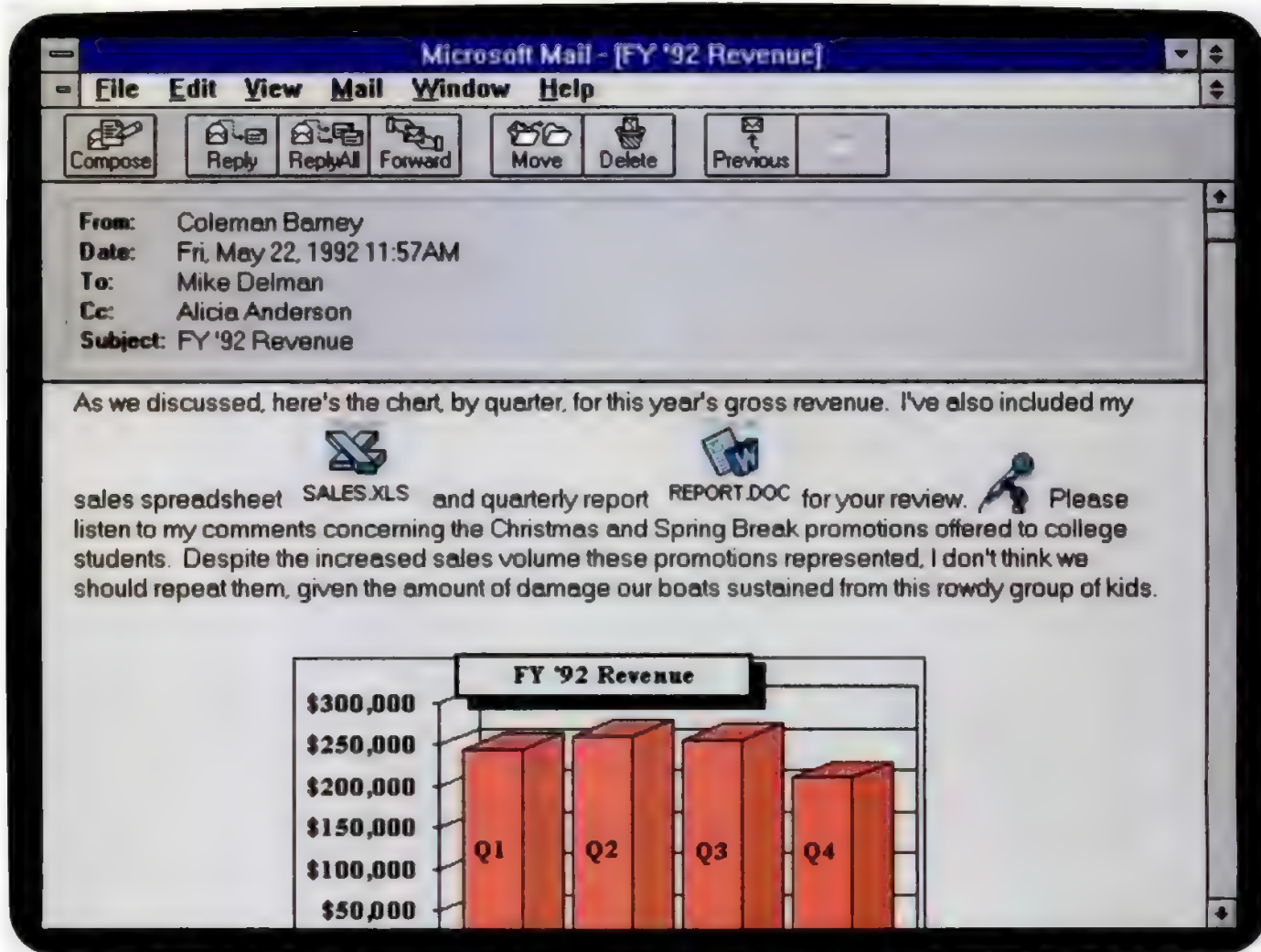
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Diagnostics and Repair	✓	✓	✓
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Floppy Disk Support	✓	✓	✓
Integral Disk Cache	✓		✓
Automount	✓	✓	
Menu-Driven Interface	✓	✓	
Universal Data Exchange (UDE™)	✓	✓	
Consolidate	✓	✓	
Recompress	✓	✓	
Windows Utility Application	NEW!		
Optibase™ JPEG Image Compression	NEW!	SuperStor Version 2	
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The Dell 320SLI's (QWERTY keys (top) are 18.2 mm apart; the HandBook's spacing is 17.8 mm.

way forces you to use a tighter typing style. But key spacing isn't the only issue.

Designers can't put 101 keys on these keyboards, so they must overlay multiple functions on single keys. Typically, there is a Fn key to access functions. The Dell's keyboard has 85 keys and overlays only the ten-key numeric keypad. Gateway gave its keyboard 78 keys and overlays

the ten keypad keys; the Home, End, PgUp, and PgDn keys; and special - function keys like Num-Lock, F11, and F12.

As users increasingly rely on mice, subnotebook designers face the challenge of giving these units a pointing device, too. Space constraints force many of the current devices to be keyboard - based. Dell uses the Fn key together with the cursor keys to simulate a mouse.

And Gateway's FieldMouse is an optional pointing device that uses the serial port.

I/O OPTIONS

For many subnotebook manufacturers, cutting back on the size and weight means cutting out external ports and adapters. Consistent with its focus on full

functionality, the Dell contains a complete set of ports, though. It comes with parallel, serial, and PS/2 ports, and an external VGA connector. The parallel port doubles as the connector for the external

floppy disk drive, and the PS/2 port automatically detects and configures itself for a mouse, keyboard, or numeric keypad. The Dell also contains one PCMCIA slot, which can be used for communications or memory expansion.

To reduce the footprint, Gateway puts only one serial and one parallel port on its subnotebook. The single serial connector emulates two virtual serial ports and relies on separate device drivers and hotkeys to switch between an attached mouse and modem. Its nonstandard parallel port is really a proprietary SCSI adapter for the Gateway's optional external floppy disk drive and I/O combination unit. The device adds a second serial and standard parallel port to the subnotebook, but unlike the Dell, the Gateway has no video or keyboard ports and contains no internal modem slot.—JG

SUBNOTEBOOK HARD DISKS

Slim Is In

Manufacturers pack more megabytes into smaller packages.

If you spend any time typing on a Chiclet-style keypad or viewing an image on a 3.5- by 7-inch screen, you will understand why subnotebooks need nearly full-size displays and key spacing. What they don't need is bulky devices. Nowhere is this more important than for hard and floppy disk drives.

While you should be concerned about cramped keyboards and image-distorting aspect ratios, it should matter little to you if your subnotebook's hard disk has flash memory or is 1.3, 1.8, or 2.5 inches, as long as it has a fast access speed and lots of memory. For most practical notebook replacements, this means at least 60MB of available space. The necessity of an external floppy disk drive is an open question, but traveling with the fewest external attachments is the goal for subnotebook - class computing.

What should matter to you is price. Miniature 1.3-inch and 1.8-

inch hard disks will save you power, weight, and real estate, but for now they are expensive, and few hold more than 40MB. Pricing hovers around \$260 for a 20MB 1.3-inch hard disk, while a 40MB 1.8-inch unit costs about \$440. Solid-state flash RAM cards, which will be available in 1993, will hold only 20MB of data and cost a small fortune—around \$600.

Flash-memory cards are better suited to hand-held and pocket PCs, which need more rugged storage devices. These cards are virtually indestructible because they're not mechanical. Drop a hard disk and you risk losing all the data on its platters. Drop a flash RAM card and you only risk getting it dirty.

For the next year, 2.5-inch hard disks with capacities that range from 40MB to 160MB will be the primary mass storage media for subnotebooks. Hard disk makers continue to reduce the height and weight of these devices, and new mod-

Sizing Up Subnotebook Hard Disk Alternatives

Platter size (inches)	Platter weight (ounces)	Bit density (bpi)	Platter capacity (1992)	Platter capacity (1993)
1.3	1.0	51,000	14MB	20MB
1.8	2.6	48,000	32MB	40MB
2.5	5.0	44,000	80MB	120MB

Today's ultra-slim hard disks can store half of what they will be able to hold 18 months from now. At 1.3 ounces, flash RAM cards are a rugged, light, and versatile alternative to mechanical devices; unfortunately, they suffer from low memory (a 20MB maximum) and high prices.

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Comparative sizes: 3.5-inch floppy disk drive; 1.3-, 1.8-, and two 2.5-inch hard disks.

els due early next year from Conner Peripherals, Quantum Corp., and Seagate Technology will weigh less than 3 ounces and be only 12.5 millimeters high.

There is good reason to wait for 1.8-inch hard disk technology to mature before buying a subnotebook. Many of these units will be low-voltage devices and have power-conservation modes built into their firmware. Future 1.8-inch hard disks will have optional PCMCIA interfaces designed for 10.5-mm Type III PCMCIA slots (see the section "Subnotebook PCMCIA Technology: Hot Slots" for more information), making them the most portable removable mass storage media yet. Prices for this technology are likely to remain high and capacities low through 1993, though.

Hard disk costs are directly proportional to the number of platters and components used. New technology like thin high-capacity single-platter 1.8-inch units use fewer parts, so eventually they will cost less to manufacture than same-capacity 2.5-inch hard disks.

While a subnotebook's footprint is largely determined by the size of the keyboard and LCD panel, its height is set by the design and layout of its internal components. The demand for a slimmer profile leads to interesting technologies. The components in the Gateway 2000 HandBook's 40MB 2.5-inch JVC hard disk are in a butterfly pattern, its circuitry and drive assembly side by side, making the

hard disk's height only 10 mm.

Slimmer profiles and lighter travel weights dismiss options like internal floppy disk drives. Not long ago, 3.5-inch floppy disk drives were considered small. Today they are the third-largest compo-

Installing a modem with your next portable will be as difficult as putting your bank card in an automatic teller machine to get the bucks to pay for it. Shrinking form factors in subnotebook designs need peripherals and components that are even smaller than standard notebook parts. One of the technologies making this happen comes from the specifications set by the PCMCIA (Personal Computer Memory Card International Association).

The PCMCIA establishes standards for credit card-size memory and I/O devices like modems, LAN adapters, and mass storage devices. These highly portable peripherals are

nent, after the display and keyboard. Shoehorning even a slimline 3.5-inch unit into a portable takes up nearly 13 cubic inches of internal space.

Even though Dell Computer Corp. and Gateway 2000 offer external drives as options for their subnotebooks, the best alternative may be no alternative. When NEC introduced the first Ultra-Lite without a floppy disk drive, users weren't ready to give up the crutch of floppy-disk file transfers.

Since then, portable-computing work habits have changed as much as the technology. Users are relying more heavily on direct, modem-linked, and network connections for communications and file transfers. Gateway 2000 includes Lap-Link XL and a transfer cable as standard equipment with its HandBook. On the Dell 320SLi, a PCMCIA modem card loaded into the Type II slot give you all the standard communications capabilities you need. With the integration of smaller, higher-capacity hard disks and flash RAM cards on subnotebook systems, maybe the time is right to ditch the floppy disk.—CB

SUBNOTEBOOK PCMCIA TECHNOLOGY

Hot Slots

Credit card-size devices slip into subnotebooks.

designed to slide into compact sockets conforming to the dimensions and connectors matching the association's specifications.

The PCMCIA's standards detail the kind of device, interface, data format, and software that is placed on the card (which is the release version), as well as the physical size of socket that accepts it (which is its type).

Also known as PC Cards, PCMCIA cards have a size and weight that are ideal for subnotebooks because current socket sizes occupy less than 2 cubic inches of a subnotebook's chassis space. PCMCIA, formed in 1989, devoted its first efforts to setting a 64MB



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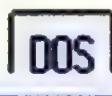
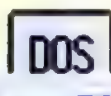
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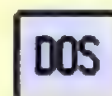
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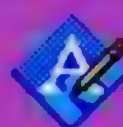


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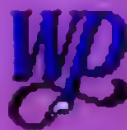
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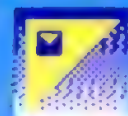
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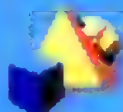
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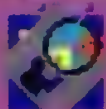
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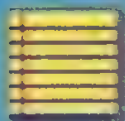
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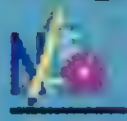
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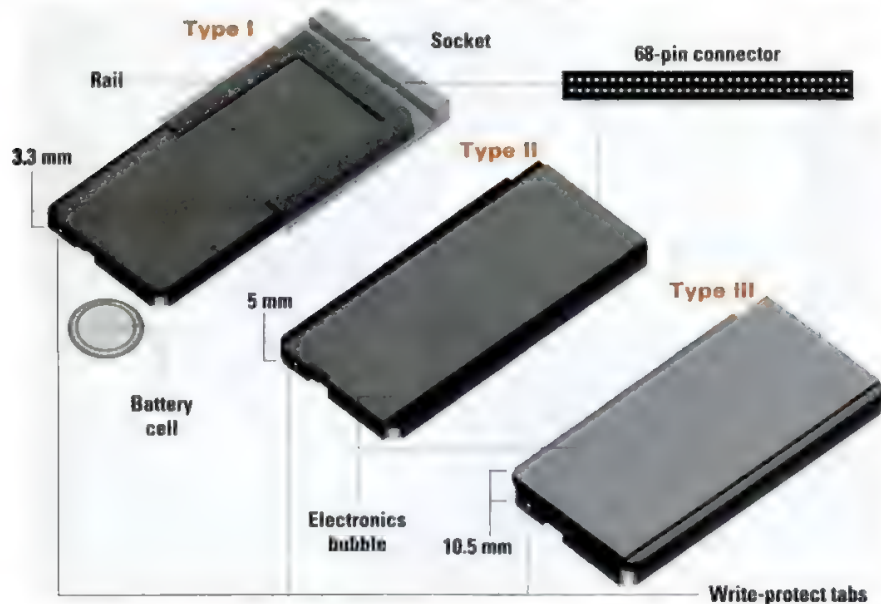
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CIRCLE 066 ON READER SERVICE CARD

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Sizing Up PCMCIA Cards



Manufactured in 3.3-, 5-, and 10.5-millimeter heights, PCMCIA cards offer removable memory and I/O capabilities, including low-power mass storage. In Type II and Type III cards, complex electronics that cannot be compressed to fit inside a Type I card overlay the surface in the form of a bubble. Today the de facto standard for PCMCIA-capable systems conforms to Type II Release 2 specifications.

memory addressing standard for PC Cards. Its premier specification, Release 1.0, was released in 1990 and owes its origins to the standard developed by the JEIDA (Japan Electronic Industry Development Association). Toshiba America used the 88-pin JEIDA spec to produce its RAM module cards for upgrade memory in its notebooks.

The first PCMCIA cards designed with Release 1.0 specifications were memory storage devices on the Poqet PC and the Hewlett-Packard HP 95LX palmtop computers. These cards actually had very little memory and were expensive, but they hinted at the versatility of the media since the cards were used for SRAM, flash memory, and One-Time-Programmable (OTP) EPROM for applications like Lotus 1-2-3.

Peripheral and system makers saw the future advantages in a common technical standard that would allow users to plug in more than just memory-on-a-card. They pushed for expansion of the PCMCIA specs. The PCMCIA's Release 2.0 in 1991 added standards for I/O devices like modems, fax/modems, and LAN adapters and made it possible for cards to draw power directly from the socket instead of from batteries (see the

accompanying diagram).

Release 2.0 defines device-specific pin assignments for the 68-pin connector, physical and electrical specifications, and additional protocols and file formats to be used with cards. These include XIP (execute in place), a protocol that allows file execution directly from the card without the file first being loaded into RAM.

At the same time, the PCMCIA standards added thicker socket sizes to accommodate the new range of peripherals. The initial Type I socket accepts a 3.3-millimeter-high card that measures 54.0 by 85.6 mm (0.1 by 2.1 by 3.4 inches, HWD). Type II uses the same width and depth but is 5 mm high (0.2 inches). A new Type III socket, which should have been adopted by the PCMCIA by the time you read this, is 10.5 mm (0.4 inches) high and will be used for miniature hard disks. The PCMCIA specifications account for cards with 135.6-mm depths that extend nearly 2 inches outside the socket, too. An 18-mm-high (0.7-inch) Type IV

socket has been proposed to handle even thicker peripherals but hasn't yet been ratified by the association members.

Even though PCMCIA's socket specification handles cards of varying heights and depths, the width of the card, the rails that hold it in place, and the 68-pin connector it plugs into remain constant. On the card itself, the extra height is added in the form of a bubble that holds all the electronics (see the diagram "Sizing Up PCMCIA Cards" for more information). This gives subnotebook manufacturers and OEMs options for building sockets into their systems to accept future card-based devices. The way the specifications are written, Type III sockets accept Type I, Type II, and Type III cards, and Type II sockets accept Type I and Type II cards. For now, most manufacturers releasing cards are designing to Type II dimensions because the Type III specification has been pending.

Type III is an important step in the evolution of the PCMCIA standard because sockets with greater heights are essential for future products. Thicker sockets let you use complex electronics that can't be compressed to 3.3-mm heights. The first modems based on chip sets from AT&T and Intel (the 14.4-kilobit-per-second v.42bis KeepInTouch Card and the Modem 2400+) fit the Type II 5-mm form factor. The first card-based Ethernet LAN adapter from Xircom is also a Type II card. However, even a 10.5-mm socket isn't high enough to handle standard I/O connectors. Today's PCMCIA

***Type III is important
in the PCMCIA stan-
dard's evolution: Taller
sockets are essential for
future products.***

modem cards require a gangly and fragile external connector that holds the RJ-11 modular telephone plug. These external connectors, called DAAs for Data-Access Arrangements, plug directly into the PC Card though a two-prong connector.

The trouble is that the DAA is easily lost or broken. External DAAs serve manufacturers by making it easier to certify one basic modem for international use, since country-specific Postal Telephone & Telegraph (PTT) information can be built into the DAA's electronics.

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CIRCLE 235 ON READER SERVICE CARD

■ The First Subnotebooks

Dell 320SLi and Gateway 2000 HandBook mix pocket and notebook features.

by Christopher Barr

By putting more computing power into tighter packages, Dell and Gateway 2000 pick up where NEC left off with its original UltraLite. The Dell 320SLi and Gateway 2000 HandBook will be the first to reach the market, but they're not the only ones. Every major notebook manufacturer, from AT&T to Zenith, is busy shaving and shrinking subnotebook designs to release systems next year. For now, a look at the current design and features of these subnotebooks offers the clearest view of where this class is heading.

Dell 320SLi

The \$2,119 Dell 320SLi has the key features to make it a true notebook replacement. Weighing 3.6 pounds, the subnotebook is powered by a 20-MHz 386SL, has a compressed 85-key keyboard, a VGA display, and is configured with a 2.5-inch 60MB hard disk. Inside, the standard model comes equipped with 2MB of RAM (expandable to 10MB) and a PCMCIA slot for an internal modem. The available socket for a Cyrix- or Intel-compatible 80387 math coprocessor adds extra power and versatility to this system, which is about the size of a copy of *PC Magazine* and is slightly thicker.

Measuring 1.3 by 7.8 by 11 inches (HWD), the Dell's standard equipment includes a 1.44MB thin-slice external floppy disk drive (0.5 by 4 by 5 inches), a 0.6-pound nickel hydride battery, and an equally lightweight AC adapter.

Among all the laptops we've seen, only the 0.5-pound battery of the CompuAdd Express 325NXL is a lighter portable power source. (For our most recent laptop review, see "386 and 486 Notebooks: Fitting the World Inside Your Briefcase," *PC Magazine*, August 1992.) Even so, the Dell's total travel weight is under 5 pounds.

Beyond the standard features, options for 80MB and 120MB 2.5-inch hard disks and extra memory give the Dell respectable expansion possibilities. The prerelease system we reviewed came ready to work with a 80387 math coprocessor, 6MB of RAM (upgraded with proprietary modules), and an Intel Modem 2,400+ card loaded into the Dell's PCMCIA slot (Release 2.0, Type II).

The Dell comes with a full set of standard I/O ports, too. The array includes a 25-pin bidirectional parallel (good for network hookups), a 9-pin serial, an external VGA, and a PS/2 mouse port. The VGA adapter doesn't provide simultaneous display with the Dell's screen panel, but will output at 800-by-600 resolution with 16 simultaneous colors. In addition, the PS/2 mouse port can also accommodate an external keyboard or numeric keypad.

The keyboard mouse uses a function key and cursor keys to move the pointer. It works in a pinch, but an embedded pointing device would add even more versatility to the marvelous keyboard.

The Dell's key caps spacing is re-

duced to only 0.72 inches. At a size close to desktop key spacing (0.75 inches), it retains a desktop's dedicated cursor keys in the desirable inverted-T layout, and PgUp, PgDn, End, and Home keys. In comparison, the Gateway's keys have a 0.70-inch spacing and the aggravating function-key combinations for PgUp, PgDn, End, and Home.

Less impressive is the Dell's 9.5-inch high-contrast panel. It is readable under most lighting conditions but is less effective than a backlit screen. The reflective screen draws much less power than a backlit screen, which means a longer battery life.

The Dell comes loaded with power-saving utilities optimized for the 386SL processor. Dell rates the battery life at 3.5 hours and estimates close to 5 hours of unaided operation with all power-saving features enabled. Our Battery Rundown test shows that you can expect 2 hours 29 minutes of unassisted power from the Dell's cell. The good news is that you can not only put it into suspend mode simply by closing the lid, you can give it a short power burst wherever you are by using the AC or optional automobile adapters.

Dell 320SLi

List Price: With 2MB RAM, 60MB hard disk, 1.44MB external floppy disk drive, DOS 5.0, Microsoft Windows 3.1, mouse, \$2,119; with 80MB hard disk, \$2,319; with 120MB hard disk, \$2,519. **Options:** 2MB RAM module, \$149; 4MB RAM upgrade, \$299; 8MB RAM upgrade, \$599; Intel Modem

2.0 standards a year ago, the association has made a critical update to its specs: the ATA or AT Attachment mass-storage specification. This creates standards for an IDE-compatible interface that lets sockets address cards as devices capable of holding up to 128 gigabytes of storage space. Type III sockets and the ATA spec clear a path for OEMs to develop high-capacity 0.4-inch-high storage de-

vices. Intel and SunDisk have already developed Type II-size 20MB flash memory storage cards, and AT&T's Flash Memory Cards come in 2.5MB, 5MB, 10MB, and 20MB configurations. Still, truly high-capacity flash memory storage devices won't be available until the technology matures and the prices come down. The card manufactured by Intel uses Microsoft's Flash File System and

costs about \$600. The cards in AT&T's line use a hardware controller and range in price from \$343 to \$2,024. In the meantime, manufacturers of ultra-slim hard disks will start to add optional PCMCIA-ATA interfaces for use in Type III sockets (see the diagram "Sizing Up PCMCIA Cards").

One of the PCMCIA goals is to have a global cross-platform standard for PC

2,400+ PCMCIA card, \$249; car battery adapter, \$129. Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759-7299; 800-289-3355, 512-338-4400; fax, 512-343-3653

Circle 486 on reader service card

Gateway 2000 HandBook

The \$1,295 Gateway 2000 HandBook

is even more portable than the Dell 320SLi and is designed for light computing tasks that demand little processing power or memory.

The Gateway pioneers two technologies. It's the first to be built around the Chips & Technologies PC/Chip and the first to use the 10-mm-thick 2.5-inch 40MB JVC hard disk. The 14-MHz PC/Chip uses far less power than any 386, which gives the Gateway an edge on battery operation. However, it essentially turns the subnotebook into an 8088-compatible system, which means it's largely restricted to running DOS character-based applications. It will run Microsoft Windows 3.0 in Real mode, but it won't run Windows 3.1. You get full notebook performance from the JVC hard disk, though. It has a butterfly layout—its head disk assembly and printed circuit board are arranged side by side rather than stacked on top of one another—giving the hard disk a slimmer profile.

Measuring 1.4 by 5.9 by 9.8 inches,

the Gateway weighs 2.3 pounds with its battery and comes standard with 1MB of RAM, which you can boost to 3MB with a 2MB module. It comes equipped with CGA display, a compressed keyboard, and a list of installed software that includes DOS 5.0, Central Point Desktop (a PIM), LapLink XL, and Microsoft Works 2.0. A cable for file

Mouse option is good for working in those few non-Windows applications that benefit from a mouse.

The Gateway overworks its I/O connectors somewhat. It comes with a 9-pin serial port and a nonstandard parallel-port interface. The serial connector doubles as the mouse port, while the parallel interface serves as a

proprietary SCSI port when it's used as the connection for the optional floppy disk drive and I/O unit. At 1.3 by 6.5 by 5.3 inches, the floppy disk drive is larger than Dell's thin-slice drive, but you get an additional parallel port (standard) and a serial port as a tradeoff for its extra dimensions.

The Gateway

2000's fully charged nickel hydride battery is rated to run up to 4.5 hours with its power-management features enabled. □

Gateway 2000 HandBook

List Price: With 1MB RAM, 40MB hard disk, DOS 5.0, Central Point Desktop, LapLink XL, Microsoft Works 2.0, \$1,295. **Options:** 2MB RAM upgrade, \$135; 1.44MB external floppy disk drive with I/O ports, \$270; 2,400/4,800-bps send-only fax modem, \$135; 2,400/9,600-bps send/receive fax modem, \$155; FieldMouse, \$35. Gateway 2000, 610 Gateway Dr., N. Sioux City, SD 57049; 800-523-2000, 605-232-2000; fax, 605-232-2023

Circle 487 on reader service card



Gateway 2000 HandBook, \$1,295 (external floppy disk drive, \$270), and Dell 320SLi, \$2,119 (with drive).

transfers also comes with the system.

The optional 1.4-pound combination external floppy disk drive and I/O unit, along with its 0.9-pound AC adapter, puts the Gateway's travel weight at slightly over 5 pounds. This will increase for on-the-road communications because you will need to add an external modem.

The Gateway's 7.6-inch backlit screen is smaller than the Dell's, but it is quite readable. You get only double-scan CGA at 640-by-400, however.

Once you go to work on the Gateway, you will find typing is not as comfortable as it is on the Dell. The cramped keyboard makes touch-typing difficult but not impossible. The Field-

Cards. Until all vendors adopt and support uniform Card and Socket Services, there is no guarantee that any off-the-shelf product will operate in all PCMCIA sockets. For now, you have to buy PCMCIA cards manufactured specifically for your subnotebook. Intel has proposed a specification called ExCA (Exchangeable-Card Architecture), but ExCA is designed primarily for x86-

based machines and may not work with the Apple environment. The Apple Newton, which is a PDA, has an investment in the PC Card, too. It proposes expansion of the PCMCIA socket to 32-bit architecture and adding bus mastering. Apple's proposal to PCMCIA means a significant alteration of the specification, since it adds more pins to the connector. ROM updates and translation drivers

may have to serve as temporary solutions to cross-platform PC Card use, but further development of the standard will give it a broader application.

If you have any doubt of the PCMCIA card's future, just visit the 50 or more vendors planning to show PCMCIA products at the Fall Comdex computer trade show in Las Vegas this November.—CB

SUBNOTEBOOK COMMUNICATIONS

Lap Lines

Making connections with wired and wireless options.

The first rule of data communications says you can have connections that are fast, long distance, or affordable—but no more than two at a time. Here's a summary of wired and wireless communications technology that use modem, cellular, and paging data links outside the office, and LAN connections inside the office.

MODEMS

To save space, subnotebook PCs were designed without dedicated modem slots; instead they use internal PCMCIA-slot modems or external modems connected to serial ports. AT&T Paradyne (Largo, Florida; 800-482-3333) introduced in late summer a 14,400-bps data/9,600-bps Group III fax modem on a Type 2.0 PCMCIA card. The KeepInTouch Card modem will be built by AT&T and sold by others. Before, PCMCIA modem technology was limited to 2,400 bps.

External modems the size of audio-cassette boxes cost \$150 to \$500 and provide 2,400- to 14,400-bps communications, some with send/receive fax capabilities. We reviewed seven high-speed modems in "Portable and Fast: Sizzling Modems to Go" (August 1992).

Modems provide an alphabet soup of protocols, most notably V.42 error control and V.42bis data compression of up to 4 to 1, as well as the earlier MNP 5 data compression and error control scheme. Microcom (Norwood, Massachusetts; 617-551-1000) promotes its MNP 10 protocol as being specifically designed for communicating over cellular networks.

If you intend to attempt cellular communications, hedge your bets and get a modem that handles V.42/V.42bis and MNP 10. To further complicate matters, an "enhanced" V.42 protocol incorporating most of the features of MNP 10 is under development, says Ken Krechmer, principal of Action Consulting, who specializes in telecommunications standards issues.

IN-THE-OFFICE CONNECTIONS

When you're in the office, you have the same range of LAN connectivity options available to users of notebook computers. For direct, wired connections to your network, you can connect the parallel

Modems You can use virtually any external modem you can plug into a serial port. PCMCIA Type II modems include the Intel-made Modem 2400+ and the AT&T-made KeepInTouch Card, a 14.4-kilobit-per-second V.42bis modem.

Pros: They let your subnotebook communicate with any other computer and platform, gain remote access to LANs, and connect to services like CompuServe and MCI Mail. Land-line units are more reliable and less expensive than wireless radio units.

Cons: No internal modems are available for subnotebooks, and the first PCMCIA-slot modems typically operate at 2,400 bps only. Land-line modem connectivity does not offer real-time data communications.

The future: Flash memory will let you easily add wireless protocols to land-line-only modems.

LANs Look for portable LAN parallel-port adapters, along with wireless infrared, spread-spectrum radio, and microwave connections. Wired and wireless PCMCIA LAN adapters are coming soon.

Pros: Infrared is inexpensive and light-weight, spread-spectrum radio is able to pass through walls, and microwave can transmit at 10 megabytes per second.

Cons: Wireless LANs are short-range, infrared requires line-of-sight connection, spread-spectrum radio suffers from frequency interference, and microwave use requires an FCC license and a big capital investment.

The future: LANs will have seamless connections between wired and wireless systems.

Cellular Communications Look for facsimile transmissions and regional information services for news and financial reports.

Pros: Some portable phones can weigh less than a pound each, cellular signals can reach 10,000 bps, and data-product costs should start to fall as sub-

scriber lists begin to rise.

port to a Xircom external adapter (Cala-basas, California; 818-878-7600). For simple subnotebook-to-PC file transfers, you can use a file-transfer package such as Traveling Software's LapLink Pro (Bothell, Washington; 206-483-8088).

Wireless LAN connections will allow subnotebook users to roam the office yet stay attached to the building or departmental LAN—without physical connections. Wireless LANs can transmit over infrared, spread-spectrum, or microwave frequencies. Infrared (IR) systems are

Subnotebook Communications

Cons: Cellular data communications is an analog and therefore unreliable world, portable phones can weigh as much as 5 pounds, seamless data coverage between networks doesn't exist, and total costs may be prohibitive. Cellular modem equipment, recurring charges, and connect time are expensive, while the quality of coverage is inconsistent and in-building communications are nearly impossible.

The future: Wait for IBM/McCaw Communications' all-digital Cellular Digital Packet Data (CDPD) network, beginning in 1993.

Data-only packet-radio networks

Proprietary systems are designed for seamless, nationwide services (such as Ardis and RAM Mobile Data). Hardware and software packages vary, but they all include message storage and forwarding.

Pros: Radio modem technology may soon be adapted so they can use wireless LAN protocols.

Cons: There is no optimization for facsimile and large file transmissions. European systems are incompatible with U.S. networks.

The future: Connections to public and LAN-based e-mail networks will go through standard software packages.

Paging Skytel's portable messaging service and Motorola's EMBARC (Electronic Mail Broadcast to a Roaming Computer) information services (news, weather, sports, and financial summaries) are available to paging receivers.

Pros: Paging receivers are lightweight, require little power, and store up to 32,000 characters. Networks provide excellent in-building coverage and cost-effective duplicate-text messaging to large groups.

Cons: One-way-only wireless service is expensive for transmitting different messages to individuals.

The future: Paging receivers on PCMCIA cards should be available in 1993.



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generally the least expensive, but they require a line of sight between the wireless modules or must bounce it off a wall- or ceiling-mounted reflector. IR devices are cheap and lightweight, and IR technology might also be used for short-distance file transfers between the subnotebook and a desktop PC or a printer. Spread-spectrum radio-frequency (RF) devices don't require a line of sight and can penetrate office partitions and walls. Unfortunately, they can be susceptible to certain types of interference, such as from in-store security systems. Microwaves can transmit data at up to 10 megabits per second, but the equipment is expensive and requires FCC licensing.

To date, the only portable-computer wireless LAN modules are too bulky to fit on PCMCIA cards. When they become able to, it is likely a healthy portion of the device will protrude from the PCMCIA slot. For an overview of wireless LAN technology, see "Portable, Affordable, Secure: Wireless LANs" in our issue of February 11, 1992.

CELLULAR, PACKET RADIO

If you want to send and receive data outside the office without a wired (phone) connection, you will be on the "bleeding" edge of technology: The equipment is bulky, balky, and expensive. Your choices today are cellular phones and packet radios.

Cellular service covers much of the U.S. with varying degrees of reliability. To make the connection, you will need four pieces of hardware: your subnotebook computer, a modem, a thick interface cable, and a cellular phone. You'll get better coverage in remote areas with a bulky 3-watt in-car transportable phone than with a 0.6-watt portable unit. The modem needs an error-control protocol: V.42/V.42bis, Telebit PEP (Packetized Ensemble Protocol), or Microcom MNP 10. The cable can cost \$300; it goes between the modem and phone and makes the modem think it's attached to a regular phone. The best-known is the Axsys cable, from Spectrum Information Technologies (Dallas, Texas; 214-630-9825). By next year, the smarts in the interface cables may be built into modems.

With a good connection, it is possible to get throughput of 5,000 to 10,000 bps. Speed is important because connect time

costs 20 to 50 cents a minute.

The second form of ready-today wireless two-way communication outside the office is packet radio. For reliability and shorter messages such as dispatching applications, packet radio beats cellular hands down. Ardis, a partnership between IBM and Motorola, uses Motorola's over-the-air packet-radio protocol (Lincolnshire, Illinois; 708-913-1215). RAM Mobile Data, a business venture of RAM Broadcasting and BellSouth Enterprises, uses the Ericsson/Swedish Telecom Mobitex protocol (New York, New York; 212-373-1930). Typical bills on either network ranges from \$40 to \$120 per month.

COST-EFFECTIVE PAGING

Paging and paging-type networks can offer cost-effective one-way data communications, with some significant advantages over two-way systems. They're small, cheap, require far less power (a battery can last for weeks), and work well inside buildings.

These paging devices are first cousins to the alphanumeric pagers carried by business people, repair technicians, and—from what we see every day on the news—crack dealers. In fact, some alphanumeric pagers can be connected via cable to your subnotebook or portable. Others are for computer connection only and have no display, such as the Motorola NewsStream "pager modem" (Boynton Beach, Florida; 407-364-2000). Pagers typically store up to 6,000 characters; a pager modem can store 32,000 characters.

Skytel (Jackson, Mississippi; 601-354-7813), a nationwide paging company, has begun to offer several wireless data services. Transmitting messages to a single person over paging systems is not cheap, but it can be extremely economical for companies that want to broadcast one message to many employees across the country. A 300-character message over Skytel can cost \$6, whether it's to one person or a few hundred people.

Motorola sells the one-way NewsStream to other paging companies and also uses this product over its new one-way EMBARC (Electronic Mail Broadcast to a Roaming Computer) network. EMBARC Communications (Boynton Beach, Florida; 800-362-2724) employs

paging technology but doesn't offer pagers. Instead, it focuses on teaming NewsStream devices with subnotebooks, and it concentrates on selling services to large corporations.

FUTURE DEVELOPMENTS

Over the next year, expect hardware to shrink in size. Both high-speed modems and paging receivers will fit on a PCMCIA card that you can slip into a palmtop, subnotebook, notebook, or pen tablet. Motorola will likely be one of the first companies with PCMCIA pagers.

One of the most anticipated developments is the introduction of the Cellular Digital Packet Data (CDPD) service, developed by IBM and McCaw Cellular Communications. By overlaying packet-data techniques on today's analog cellular systems, data is supposed to be transmitted at 19,200 bps. CDPD is an important interim step between today's hit-and-miss analog cellular connections and the all-digital cellular network likely to become a commercial service (in a few areas only) in 1993. (New cellular phones will be both digital and analog, since the switch-over from analog service will take many years.)

CDPD is a nonproprietary protocol that may be used by any cellular carrier when it becomes available in 1993. For CDPD, you will need to buy a special modem; these should be available in several versions, ranging from external portable devices to internal modems incorporated in cellular phones.

For two-way communications over Ardis-type networks, Motorola (Richmond, British Columbia, Canada; 800-678-7634) is introducing a new packet-radio modem—codenamed Pearl—with an LCD, keyboard, and programmable function keys so the device can also be used as a simple standalone data terminal. Pearl is likely to be a substitute for a subnotebook rather than an adjunct.

Ericsson GE Communications (Paramus, New Jersey; 201-265-6600) is offering its first board-level radio modem module OEMs to incorporate into portable computers. It would be the built-in-a-computer equivalent of the company's standalone Mobidem packet-radio transceiver, though the product might be too big and power-hungry for subnotebooks.—Alan A. Reiter □

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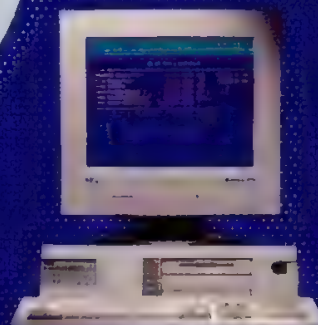
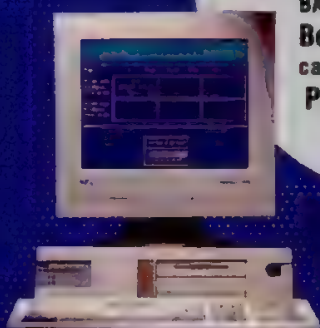
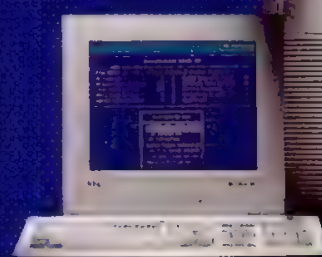


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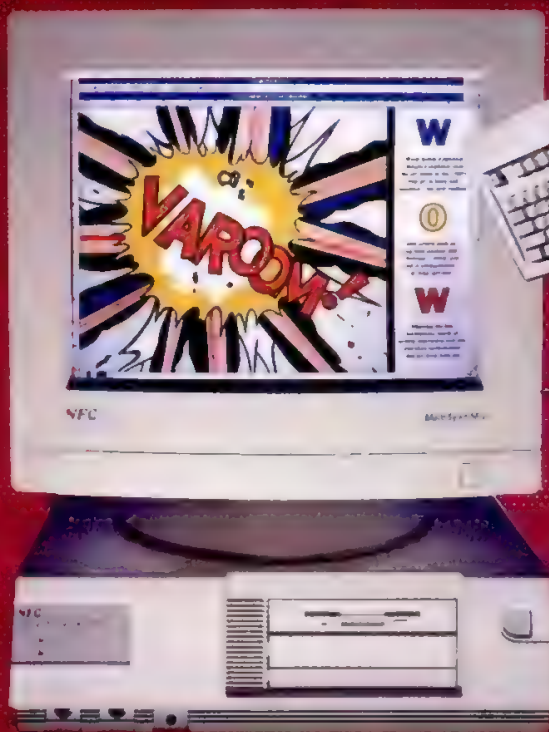
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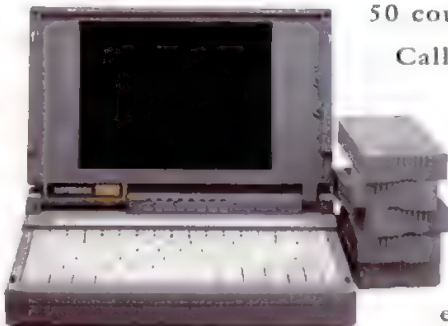
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LOCAL-BUS TECHNOLOGY

Video Takes A New Route

Higher graphics resolutions and more colors add up to video bottlenecks on the standard 8-MHz, 16-bit ISA bus. Local-bus technology breaks the bottleneck by bringing peripherals like video controllers up to clock speed.

When it comes to computer graphics, it's faster to take the local bus than the expansion bus. GUIs (graphical user interfaces) like Microsoft Windows 3.1 can choke a video adapter sitting on the 8-MHz, 16-bit ISA (Industry Standard Architecture) expansion bus. By putting peripherals on a CPU's local bus, adapters like video controllers can gain access to the CPU's 32-bit bus running at full clock speed. On a 33-MHz 486 local-bus PC, a video controller could match the 33-MHz clock speed of the processor.

The question for users is whether or not they should climb aboard the local bus. The price of a ticket looks enticing. A PC with local-bus video can cost as little as \$100 more than a comparable standard ISA-based PC, while delivering video performance that's 2 to 15 times as fast as a standard VGA adapter.

Unfortunately, you can't upgrade your current system. You have to be in



by John R. Quain

the market for a new PC or motherboard, preferably a 486. Though the 386DX CPU has a 32-bit bus, you won't see many local-bus designs based on it because the performance gains are not nearly as great as those of 486 implementations.

BOARDING THE BUS

The earliest local-bus PC ventures were based on proprietary ISA implementations, as are some recent designs. In fact, at review time, only the proprietary local-bus systems were shipping to end users.

More recently, there's been lobbying for two new local-bus standards: VL-Bus, a standard proposed by the VESA (Video Electronics Standards Association) committee, and PCI (Peripheral Component Interconnect), which is the brainchild of Intel Corp. The products we looked at that conform to the VESA specifications were engineering samples at review time, but should be available by the time you read this. The PCI specifications won't be finalized until the beginning of 1993, so no preproduction units were available for testing.

Our sample of systems using proprietary local-bus video includes designs from CSS Laboratories, Dell Computer, Northgate Computer Systems, NEC

Technologies, Orchid Technology, and Swan Technologies. All but the Dell, which uses a 50-MHz 486DX2 chip, were 486DX/33 PCs.

The prototype local-bus motherboard from Micronics Computers that PC Magazine Labs evaluated conforms to the VESA local-bus specifications. We tested this in conjunction with preproduction, VESA-compliant adapters from Tseng Laboratories and ATI Technologies.

Where possible, we also tested ISA and EISA versions of these video designs for comparison. We also tested an IBM XGA adapter in IBM's 33-MHz PS/2 Model 90, and a Compaq QVision 1024E EISA adapter in the Compaq DeskPro/M 486/33. (See the sidebar "QVision: Fast Video on a Slow Bus" for more information on that product.)

The results show that there are definite gains to be had from a local-bus video design, but those gains are not easily won. To properly utilize the local bus, graphics controllers need to be specifically designed for the task. In fact, local-bus systems that use a graphics controller not originally engineered for that architecture lagged behind two new non-local-bus products, the QVision 1024E EISA

card and ATI's Graphics Ultra Pro ISA card.

To understand why moving to the local bus can make a difference to video performance, you need to look at the limitations of the AT-style PC and the data throughput requirements of today's GUI (graphical user interface) applications.

In a typical ISA PC, the CPU on the motherboard needs two sets of electrical paths to convey information: the local CPU bus and the expansion bus. Components on the local bus work synchronously with the CPU, meaning that in the case of a 33-MHz 486DX, they communicate with the CPU at the full 33-MHz clock speed on a 32-bit wide data path. Only a few chips are connected to the local bus, including the PC's main memory and controller logic.

The other components—disk controllers, modems, and video adapters—ride the slower 8-MHz expansion bus. Originally, the expansion bus was synchronous with the CPU, but when CPU speeds exceeded 10 MHz, peripherals on the 8-MHz expansion bus could not keep up. The current ISA expansion bus runs asynchronously at 8 MHz to prevent expansion devices from delaying the CPU. Peripherals perform tasks at their own pace, sending a ready signal to the system's control logic when a task is complete.

EISA (Extended Industry Standard Architecture) and MCA (IBM's Micro Channel architecture) are similarly limited regarding the rate at which peripherals on the expansion bus can operate. The EISA expansion bus operates at up to 8.33 MHz and the MCA expansion bus operates at up to 10 MHz (although it allows for special modes that can reach up to 16 MHz). Both EISA and MCA offer a 32-bit expansion bus (compared to ISA's 16-bit bus), but they still cannot run at the speed of a local bus.

PIXEL-PUSHING POWER

Meanwhile, higher graphics resolutions with more colors require more and more pixel-pushing power. True, a standard DOS text screen of 25 rows and 80 columns only requires about 4K of information. But GUIs like Windows need a whole lot more.

The default Windows VGA screen of 16 colors and 640 by 480 pixels, for exam-

HIGHLIGHTS

Local-Bus Technology

LOCAL-BUS technology speeds performance by putting peripherals like video controllers directly on the CPU's 32-bit bus and allowing them to run at full clock speed.

PROPRIETARY local-bus implementations are not new, but much of the interest in the industry currently focuses on two proposed local-bus standards: VESA's VL-Bus and Intel's PCI.

FAST PERFORMANCE doesn't have to equal high price. A PC with local bus video can cost as little as \$100 more than a comparable ISA-based unit.

THE GREATEST IMPACT local-bus technology will have is on GUI and graphics-intensive applications. When dealing with color bitmapped

images or graphics animation at high resolutions, even ISA-based graphics accelerators or coprocessors have a hard time overcoming the bottlenecks imposed by the 8-MHz expansion bus.

THE PROMISE of local bus is enticing, but current local-bus video implementations can be limited by a variety of factors, such as a video chip that is not suited to the faster and wider CPU bus or one that has bandwidth limitations.

CURRENT implementations of dumb frame buffers like the Tseng ET4000 clearly benefit from local-bus connections, as does (to a lesser degree) S3's 86C911 accelerator. ATI's Mach 32 chip provided the best performance, both in its local-bus and ISA implementations.

Local-Bus Video

ple, requires 154K of information (640 multiplied by 480 pixels, multiplied by 4 bits per pixel, and then divided by 8 bits). Though substantially larger than DOS requirements, this still may not seem like much of a challenge for graphics adapters. Once you start increasing the resolution and adding colors, though, the picture changes.

A comfortable Windows format for users with 15-inch monitors is 800-by-600 resolution with 256 colors. Using 8 bits per pixel, this translates into 480K of information. Move up to photo-realistic images using 24-bit color, and you'll need 1.4MB per screen. Upgrade to a 20-inch monitor and you'll want to move up to 1,024-by-768 resolution—without giving up the 16.7 million colors available in 24-bit mode, of course. At this rate, your graphics adapter will need real muscle to move screens of 2.3MB.

All the graphics subsystems we examined can display noninterlaced resolutions of 1,024 by 768 pixels (though only in 256 colors), which means you get more information on-screen—more icons in

Window's Program Manager, more columns in Microsoft Excel, and more lines in Ami Pro. But pouring this many pixels through a standard VGA adapter on the old AT-style ISA bus is like trying to pour water from a four-foot diameter pipe into a half-inch garden hose.

Until recently, there were two solutions to the video bottleneck: graphics coprocessors and graphics accelerators. Graphics coprocessors, such as Texas Instruments' 34010 and 34020 chips, boost video performance by assuming tasks normally handled by the CPU. Graphics coprocessors are programmable—that is, they can execute a C program. Coprocessed boards are fast but expensive, ranging from \$600 to \$3,000.

With prices ranging from under \$200 to \$600 (most sell for below \$500), GUI accelerators offer a considerable price/performance benefit. Like coprocessors, accelerators take control of graphics tasks otherwise performed by the CPU, but they are not programmable. They are fixed-function processors with specific tasks—particularly, Windows graphics

tasks—hard-coded into the chip. This has one disadvantage: While the accelerator may excel in one application, it can bog down in another. S3 Inc.'s 86C911 GUI accelerator, for example, easily outdistances a dumb frame buffer VGA controller like the Tseng ET4000 in Windows, but when in DOS 640-by-480 mode, our VGA hardware tests show the S3 to be the slower chip.

In most cases, such as scrolling through a Windows spreadsheet or opening a dialog box, coprocessors and accelerators are fine. When you're using an accelerator with a Graphics Winmark score of around six million, these screen changes seem instantaneous. But at Super VGA resolutions or higher, when color bitmapped images, animation, or shading in AutoCAD comes into play, your screen won't be so zippy. That's because the bottleneck—the expansion bus—is still there.

In theory, an 8-MHz ISA bus could achieve an absolute maximum throughput of 16MB per second (it's more like 2.5MB in practice). EISA and MCA expansion buses have comparable constraints. Theoretically, an 8.33-MHz, 32-bit EISA expansion bus has a maximum throughput of 32MB per second, while the slightly faster 10-MHz 32-bit MCA bus has a maximum throughput of 40MB per second. On the other hand, a 33-MHz 486 local bus could achieve 132MB per second. *In theory* is the key phrase here. There are several factors that prevent current local-bus video designs from actually reaching the 132MB ceiling.

First, the CPU must deal not only with the local bus device, but also—at the very least—with its own system memory. That means the graphics controller can't always be on-line.

Second, the CPU can't process instructions instantaneously. It may take a cycle or two before it can send a particular instruction to the video controller. Third, the peripheral can't process instructions instantaneously either. With the video controllers we reviewed, this CPU-graphics controller interaction typically takes at least four clock cycles on a 33-MHz 486 local bus.

Additionally, the proprietary local-bus designs we saw used some buffering or logic to compensate for timing differences or I/O path differences. If they're

■ Local Bus: *How To Get in Touch*

For this survey of local-bus and comparative video technologies, we included products from the companies listed below.

ATI Technologies Inc., 3761 Victoria Park Ave., Scarborough, Ontario, Canada M1W 3S2; 416-756-0718.

Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269-2000; 800-345-1518, 713-370-0670.

CSS Laboratories Inc., 1641 McGaw Ave., Irvine, CA 92714; 800-966-2771, 714-852-8161.

Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759-7299; 800-289-3355, 512-338-4400.

IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; 800-426-7378, 800-772-2227.

Micronics Computers Inc., 232 E.

Warren Ave., Fremont, CA 94539-7085; 510-651-2300.

NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; 800-632-4636, 508-264-8000.

Northgate Computer Systems Inc., P.O. Box 59080, Minneapolis, MN 55459-0080; 800-548-1993, 612-943-8181.

Orchid Technology, 45365 Northport Loop West, Fremont, CA 94538; 800-767-2443, 510-683-0300.

Polywell Computers Inc., 61-C Airport Blvd., South San Francisco, CA 94080; 800-999-1278, 415-583-7222.

Swan Technologies Inc., 3075 Research Dr., State College, PA 16801; 800-468-9044, 814-234-2236.

Tseng Labs Inc., 6 Terry Dr., Newtown, PA 18940; 215-968-0502. □

not carefully designed, buffers and so-called glue logic can add more wait states.

Finally, not all graphics controllers are equal. GUI accelerators and dumb frame buffers hooked up to the local bus will experience differing levels of improvement. Depending on the type of chip, some controllers—whether they're accelerators or dumb frame buffers—are better suited to the faster and wider CPU bus, while others hit performance ceilings due to bandwidth limitations (the overall information-processing speed of the chip). Local-bus video is not quite the simple remedy some would have you believe.

Software drivers make a difference, too. A GUI accelerator, for example, may have impressive abilities, but if those abilities are not turned on by the proper driver, they won't do you much good.

TSENG ON THE LOCAL BUS

The first major PC maker to offer video on the local bus was NEC Technologies. In September 1991, the company premiered its proprietary Image Video design based on the Tseng Labs ET4000 VGA dumb frame buffer controller. We tested this video subsystem in NEC's PowerMate 486/33i slimline desktop PC. The ISA-based unit includes a 120MB hard drive, a 1.44MB floppy drive, and 4MB of DRAM (dynamic RAM) in its \$2,499 standard configuration.

In the NEC design, the Tseng ET4000 is located on the motherboard along with 1MB of DRAM display memory and an OPTi chip set. In Super VGA mode with 256 colors, the NEC design put in a Graphics Winmark score of only 3.27 million but maintained power in 1,024-by-768 mode, posting 3.32 million.

Though such Winmark scores are shy of the 6.0-million-plus of some of the ISA GUI accelerators in this roundup and the double-digit results of the leaders, clearly the Tseng chip benefits from the local-bus connection. Orchid's ET4000-based ProDesigner IIs ISA adapter, for example, turned in a Winmark score of 2.45 million in Super VGA mode and 2.43 million in 1,024-by-768 mode. Even an EISA version of the ProDesigner IIs could not compete with the Tseng ET4000 on the NEC local bus; it scored only 2.81 million in Super VGA mode and 2.85 million in 1,024-by-768 mode. (Orchid's ET4000

■ QVision: Fast Video On a Slow Bus

by John R. Quain

Names like Tseng and ATI are familiar fixtures on the computer graphics and video scene. But now another name is turning heads—Compaq.

The Compaq QVision 1024E EISA card flies past conventional VGA and graphics accelerators, posting Graphics Winmark scores of 16.71 million in 800-by-600 mode and 18.12 million in 1,024-by-768 mode. In our tests, the QVision card was surpassed by only the ATI prototypes.

The QVision's next-nearest competitor—Dell's DGX—posted Winmark scores of only 14.41 million in Super VGA and 14.92 million in 1,024-by-768 mode. The Dell design, however, relies on a faster 50-MHz 486DX2 PC with a local-bus video linear addressing design. What's noteworthy about the QVision's performance is that Compaq did not go to the local bus to get it.

The QVision 1024E is a full 32-bit EISA adapter that uses the 8.33-MHz 32-bit expansion bus, passes data from its controller to VRAM at 32 bits, and processes 32-bit instructions. The board is based on a proprietary Compaq GUI accelerator. Common Windows operations, such as BitBlts, area fills, and line draws, are built in, as is a 32-by-32 pixel hardware cursor.

Putting these functions into hardware allows the QVision adapter to perform the operations in VRAM, relying only minimally on the CPU for color and size attributes. The more information that can be manipulated on the video adapter, the less time spent waiting for information to crawl across the expansion bus.

For most users, these hardware-accelerator techniques deliver swift screen changes. But as resolutions and color depths increase, the pixel de-

mands decelerate most GUI accelerators. So the QVision's software driver employs an additional technique—linear addressing—to keep the pixels pumping.

Unlike the standard approach of putting software functions in hardware, linear addressing is a fancy memory maneuver. In most PCs, the amount of memory the CPU sees as video memory is restricted to 64K. Using such a small memory window to handle large graphics operations means cutting them up to squeeze them through the tiny window. It also means that on the receiving end, the video controller has to waste time pasting all those segments back together.

Linear addressing works around this limitation by setting aside a larger contiguous memory space as display memory (in the QVision's case, 1MB of VRAM). This frees up the CPU and graphics controller by eliminating the coordinating calculations required by the standard 64K segments.

In all, Compaq's QVision adapter illustrates just how much performance is still left in the old 8.33-MHz expansion bus. Using a Brooktree RAMDAC, the adapter can display non-interlaced resolutions up to 1,024-by-768 pixels with 256 colors at a 72Hz vertical refresh rate. Dropping the resolution to Super VGA at 72Hz, it will display up to 64,000 colors.

We tested the card in the \$4,268 Windows edition of the Compaq DeskPro/M 486/33, which also includes 4MB of RAM, a 120MB hard drive, and a 15-inch QVision monitor.

If you already own a Compaq machine and want to bring your video up to speed, the QVision 1024E adapter card (or the ISA version, QVision 1024I) is available for \$599. □

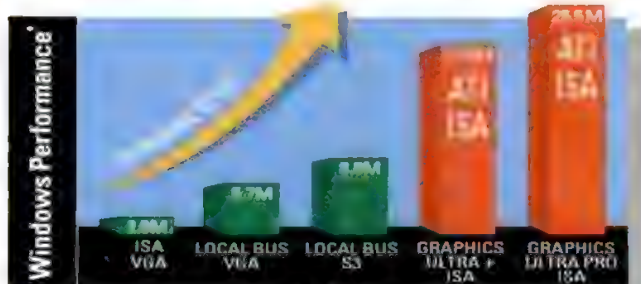


Which bus route for faster Windows performance?

Wondering what the right answer is? If so, you are asking the wrong question. Graphics acceleration is the most important factor for Windows performance ... not the bus architecture.

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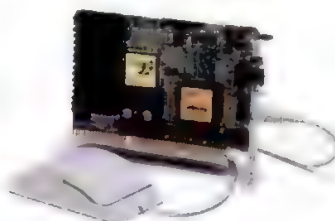
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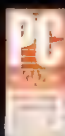
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■ **PCI:** *The Next PC Architecture?*

by John R. Quain

No one needs to be lectured about the need for standards. This lesson is amply demonstrated by the longevity of the 10-year-old AT-style ISA bus, despite challenges from MCA and EISA. But increased data requirements—especially high-resolution graphics—have exhausted the ISA bus's capacity.

Two local-bus solutions have been proposed as standards: one from the Video Electronics Standards Association (VESA) and one from Intel Corp. Though both say the new proposals are just supplements to ISA, EISA, and MCA architectures, a close look suggests otherwise. After all, how many expansion slots does the average user need?

Intel's Peripheral Component Interconnect (PCI) specification is designed to accommodate faster CPUs without requiring constant peripheral upgrades and redesigns. Though the PCI specification is still very preliminary, its potential strengths can best be understood in comparison to the VESA local-bus (VL-Bus) specification.

In terms of data throughput, the two are nearly identical: VESA claims a sustained raw throughput of 130MB per second and Intel claims a data throughput of 120MB per second (132MB per second peak). Both approaches can run peripherals at up to 33 MHz and are designed to work with ISA, EISA, and MCA architectures. Neither require new software, and both appear to have support from many vendors. From here on the two specifications diverge.

FORKS IN THE ROAD

Though it can accept chip-level peripherals on the motherboard, the VL-Bus design has focused on boards using a standard MCA-style connector. Intel focuses instead on the electrical specifications for peripheral-chip makers and the rough logic requirements of

a PCI controller. Intel expects a PCI Special Interest Group to hammer out a specification for a standard adapter connector.

The VL-Bus allows up to three peripherals to operate on what is basically the local 32-bit CPU bus. Using a VL-Bus controller, VESA's specification enables these peripherals to operate at up to 33 MHz. Above 33 MHz, timings and electrical loads become more critical and either wait states must be introduced (effectively reducing the speed at which the components can operate) or fewer than three peripherals must be attached to the local bus.

The VL-Bus approach has its shortcomings, however. For one, although the architecture allows bus mastering, the local bus will be temporarily tied up by the bus-mastering card. That means the CPU and a bus-mastering adapter cannot work concurrently. Moreover, there's no full burst mode. But the primary advantage of the VESA design is that it can be implemented by motherboard and adapter card manufacturers quickly and inexpensively.

Intel's PCI bus specification requires more work on the part of peripheral chip makers but offers several theoretical advantages over the VL-Bus. In the first place, the specification allows up to ten peripherals to work on the PCI bus (including the PCI controller and an optional expansion-bus controller for ISA, EISA, or MCA). It, too, is limited to 33 MHz, but it allows the PCI controller to use a 32-bit or a 64-bit data connection to the CPU.

In addition, the PCI specification allows the CPU to run concurrently with bus-mastering peripherals—a necessary capability for future multimedia tasks. And the Intel approach allows a full burst mode for reads and writes (Intel's 486 only allows bursts on reads.)

Essentially, the PCI architecture is a CPU-to-local bus bridge with FIFO

(first in, first out) buffers. Intel calls it an "intermediate" bus because it is designed to uncouple the CPU from the expansion bus while maintaining a 33-MHz 32-bit path to peripheral devices. By taking this approach, the PCI controller makes it possible to queue writes and reads between the CPU and PCI peripherals. In theory, this would enable manufacturers to use a single motherboard design for several generations of CPUs. It also means more sophisticated controller logic is necessary for the PCI interface and for PCI peripheral chips.

The PCI design requires peripherals to feed configuration information back to the controller. This means redesigning many current peripheral chips. Furthermore, PCI borrows a technique called multiplexing, already employed by the 486 microprocessor. Multiplexing allows more than one signal to be sent on the same electrical path. The benefit is that peripheral chips will need fewer pins, and thus will cost less to produce. But again, it means reworking current chips to meet the standard.

Though Intel's standard is in the embryonic stage, the company has clearly focused on electrical issues at the expense of third-party concerns. For example, PCI uses a reflective-wave electrical design so that only half the amplification is needed to pass signals along the bus. This solves some electrical-inductance problems and creates less noise. But because PCI does not specify a particular arbitration scheme (yet), many vendors are worried that not every PCI peripheral will work in all PCI PCs.

PERFORMANCE DIFFERENCES

One apparent performance difference between the competing standards is that increasing the CPU power of a VL-Bus PC may quickly reach a point of diminishing returns. Most peripherals will not be able to keep up with

CONTINUED

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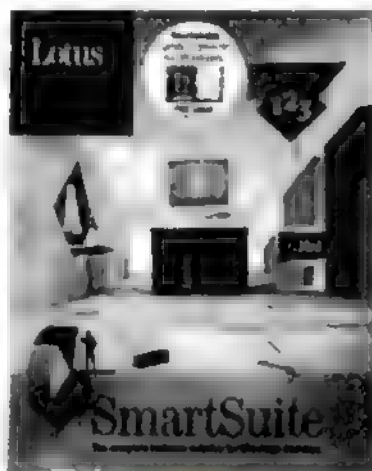
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Intel's PCI

CONTINUES

faster CPUs, and because the VL-Bus design is synchronous with the processor, wait states may have to be introduced. With a PCI architecture, peripherals still won't be able to keep up with faster CPUs, but fewer wait states may be introduced. As soon as a PCI peripheral has completed an operation, it can write the information to the PCI controller and go on.

To match the potential capabilities of the PCI standard, VESA already is working on a "mezzanine" spec that will support ten devices and concurrent bus-mastered devices. Anticipating Intel's P5 processor to be introduced in the first quarter of 1993, VESA is also adding 64-bit support to the local CPU bus spec.

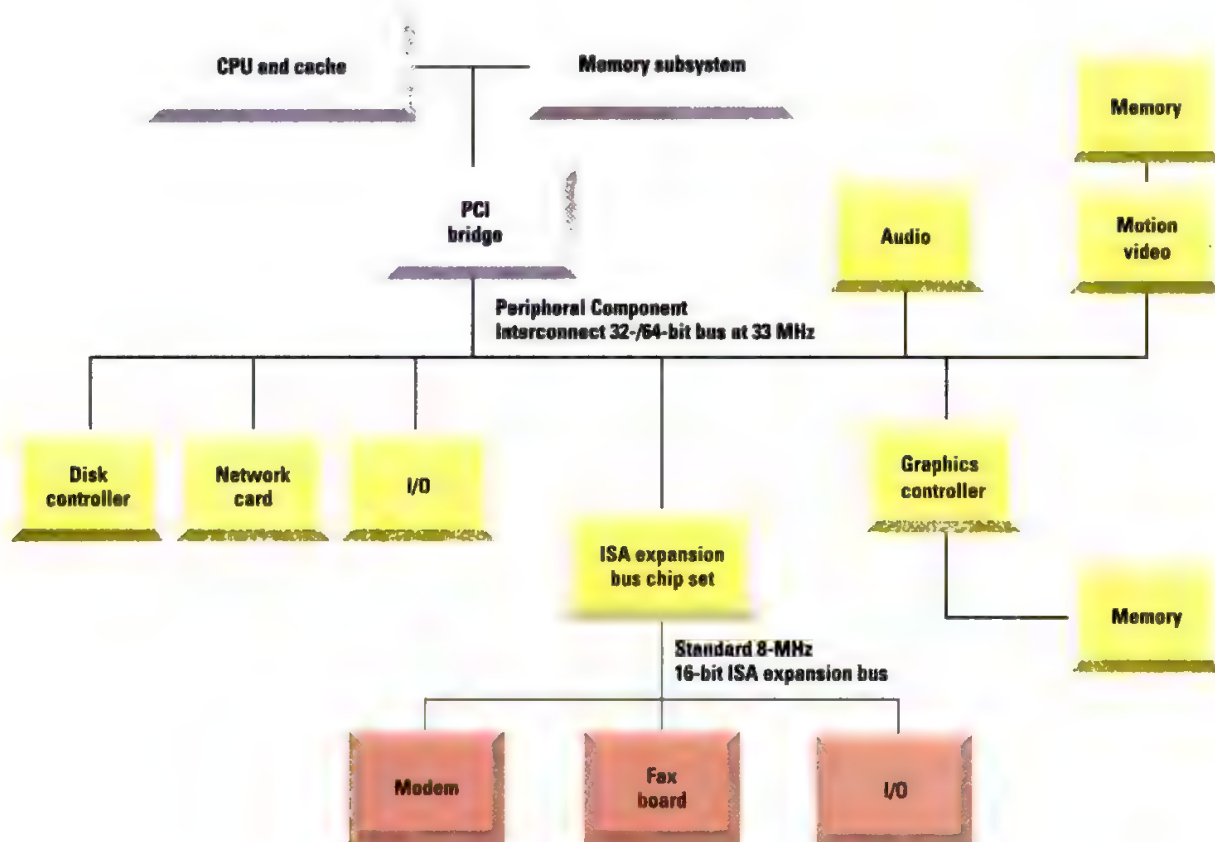
Although both VESA and Intel are denying an imminent bus war, both solutions cannot comfortably coexist on the desktop. However, at least one system board maker—CMS Enhancements (2722 Michelson Dr., Irvine, CA 92715; 714-222-6000)—has proposed a hardware solution for confused customers. CMS's system uncouples the entire bus from the CPU and system memory. Using 132-pin MCA-style bus boards that connect directly into the CPU bus, CMS claims that users will be able to choose between architectures. If you want to have a VL-Bus now, you can buy its 132-pin VL-Bus board. Later, if you decide to go with PCI, CMS will sell you a PCI board replacement.

Buyers should note that at this writing, both bus specifications are still evolving. Performance claims and ca-

pabilities may change. VL-Bus PCs, however, should be shipping to end users by the time you read this, while PCI systems aren't expected until the beginning of next year at the earliest. (Among the companies that have announced their intent to build or support PCI-compliant systems or devices are ATI Technologies, S3 Inc., Tseng Laboratories, Compaq Computer, Dell Computer, Hewlett-Packard, IBM, Micronics Computers, and NEC Technologies.)

The apparent advantages of Intel's forward-looking PCI proposal—and the fact that its specification can anticipate Intel's own CPU plans—won't mean much unless more details of the specification are worked out quickly. Otherwise, Intel may find itself struggling to keep PCI afloat in a rising tide of VL-Bus PCs and adapter cards. □

INTEL'S PCI



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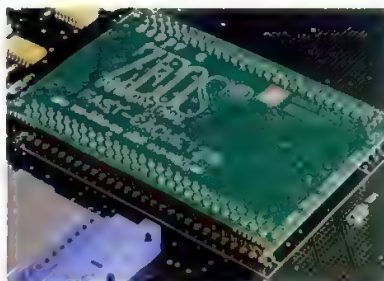
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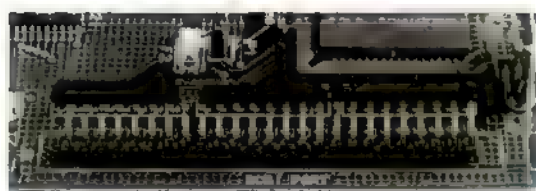
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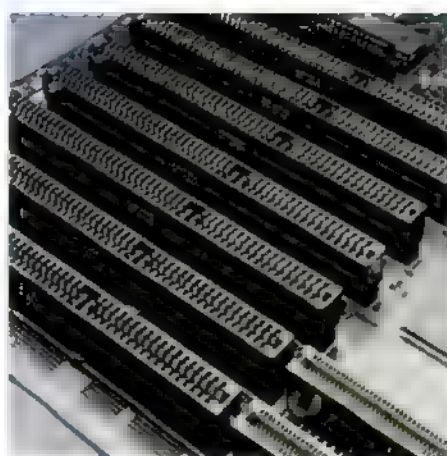
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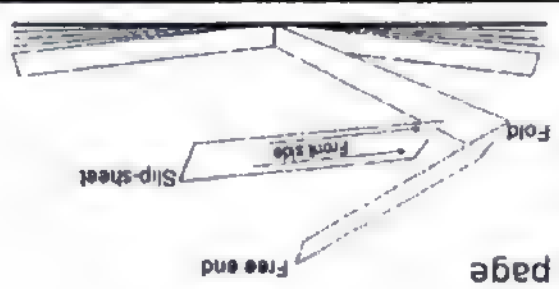
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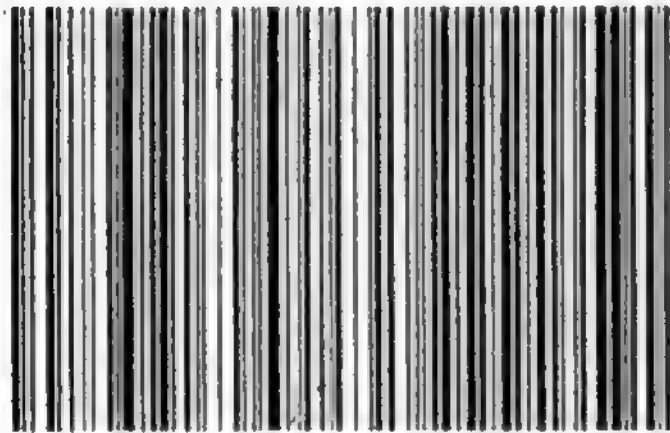
1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
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3. Slice the folded edge
4. Close the page and slip-sheet

Folded edge of the page



1. Follow instructions on the other side

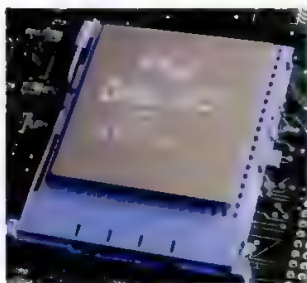
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City _____ State _____ Zip _____ Previous Employer _____ From _____ To _____
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Bank Loan	☐ Yes	☐ No	Other Major Charge Cards	☐ Yes	☐ No
VISA	☐ Yes	☐ No	Finance Company Loan	☐ Yes	☐ No
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proprietary local-bus card, the Pro-Designer IIs/D, which was tested on a Polywell system, posted about the same numbers as the NEC in Super VGA.)

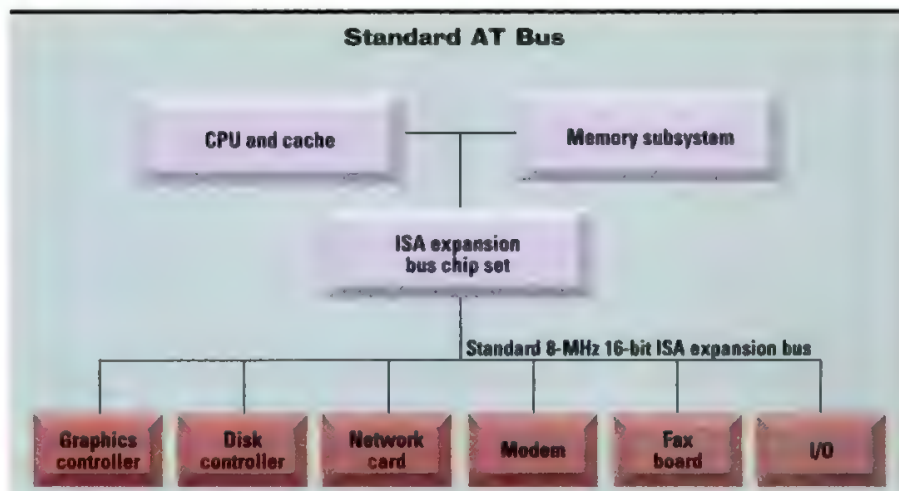
Though there's a measurable performance increase, NEC's local-bus ET4000 controller doesn't offer a tremendous gain. Part of the reason is that the ET4000 was not designed for 32-bit buses. It has a 16-bit wide I/O path, processes 16-bit instructions, and lacks any accelerated drawing functions. But even with these restrictions, there's still lots of performance left in the ET4000.

The importance of software drivers on the local bus was demonstrated by Tseng's ET4000-based VL-Bus prototype adapter card. Tested with the Micronics motherboard, the VESA-compliant adapter first turned in Graphics Winmark results similar to the ET4000 local-bus designs from NEC and Orchid. When new Tseng drivers optimized for the VL-Bus design were installed, however, the adapter nearly doubled its scores: 6.35 million in Super VGA and 6.67 million in 1,024-by-768 mode. (It also turned in the best DOS VGA performance.) Adapters based on the Tseng VL-Bus implementation should be available from OEMs this fall.

AN ACCELERATOR GOES LOCAL

To see what kind of performance could be drawn out of a GUI accelerator connected to the CPU's local bus, we tested the widely used 86C911 accelerator from S3 on three local-bus designs: CSS's Preferred 486/33GA, Swan's 486/33DB (with its Direct Bus system), and Orchid's Fahrenheit 1280°/D adapter in a Polywell 486-33L PC.

In its standard configuration, the CSS Preferred 486/33GA (\$3,259) comes with a 120MB hard drive, 4MB of DRAM, 1.44MB and 1.2MB floppies, the local-bus video card, and a Viewsonic 6 14-inch monitor. The system is based on a CSS motherboard that uses a proprietary EISA-like slot to connect the video adapter to the local bus. The local-bus connector also accommodates 8- or 16-bit ISA adapters. When an ISA adapter



is installed, it is routed through the 16-bit, 8-MHz expansion bus.

The local-bus video adapter in CSS's ISA system is one of its own, an 86C911-based MaxGraphics/32 with 1MB of VRAM (video RAM). Unfortunately, CSS proved that it takes more than just a 32-bit slot to tap the full potential of the local bus. The MaxGraphics/32 actually turned in only slightly better Super VGA Winmark scores than Orchid's ISA 86C911-based Fahrenheit 1280° (7.70 million versus 6.13 million).

Swan's implementation didn't fair much better. Tests were conducted on the company's 486/33DB ISA PC, which includes a 120MB hard drive, 1.2MB and 1.44MB floppy drives, 4MB of DRAM, and a 14-inch Super VGA color monitor in its \$2,495 standard configuration. The Swan system uses a full-length CPU card connected to the system board via a 32-bit proprietary connector. The CPU module harbors the 486 processor, an 86C911 GUI accelerator, and 1MB of VRAM. Following CSS's example, Swan's local-bus implementation managed a score of only 7.67 million Winmarks in Super VGA against the 6.13 million Winmarks of the ISA Fahrenheit 1280°.

Swan's design fared appreciably better when the ante was upped to 1,024 by 768 pixels. In this mode, it better demonstrated the superiority of the local-bus connection, increasing its throughput on our tests to 9.05 million Winmarks.

The only local-bus implementation of the 86C911 that demonstrated a substantial improvement over the ISA version in Super VGA was the Orchid Fahrenheit 1280°/D, Orchid's own local-bus version of the Fahrenheit 1280° ISA, with a Winmark score of 8.39 million. We tested this in Polywell Computers' Poly 486-33L ISA PC, which has a 130MB hard drive, 1.44 and 1.2MB floppy drives, 4MB of DRAM, and a 14-inch Super VGA monitor in its \$2,385 standard configuration.

The Poly 486-33L uses Orchid's Superboard 486 motherboard based on OPTi's proprietary local-bus chip set. The chip set allows adapters to communicate with the CPU's local bus via a 32-bit EISA-style connector. Orchid's Fahrenheit 1280°/D local-bus card occupies this spot, though the slot will also accept an 8-bit ISA card. Aside from the EISA-like connection, the Fahrenheit 1280°/D is pretty much unchanged compared to its ISA predecessor.

REPAIRS NEEDED

Despite the performance improvements, there are three reasons why no tremendous gain is realized in the case of local-bus S3 86C911 implementations. First, the 86C911 is designed to perform as many Windows functions as possible without crossing the bus interface. Therefore, it won't take full advantage of the 32-bit path of the local bus.

Second, even though it can accept a 32-bit wide data path from the local bus, the 86C911 only processes 16-bit instructions. Consequently, when the S3 GUI accelerator is placed on a local bus, it can't keep up with the additional infor-

***The S3 86C911 won't
take full advantage
of the 32-bit path of
the local bus.***

mation. Finally, the bandwidth of the 86C911 is constrained because it can only deal with its display memory using a 16-bit path. Despite these limitations, local-bus versions of the 86C911 GUI accelerator are still decisively faster under Windows than local-bus designs using the Tseng ET4000.

ONE STEP AHEAD

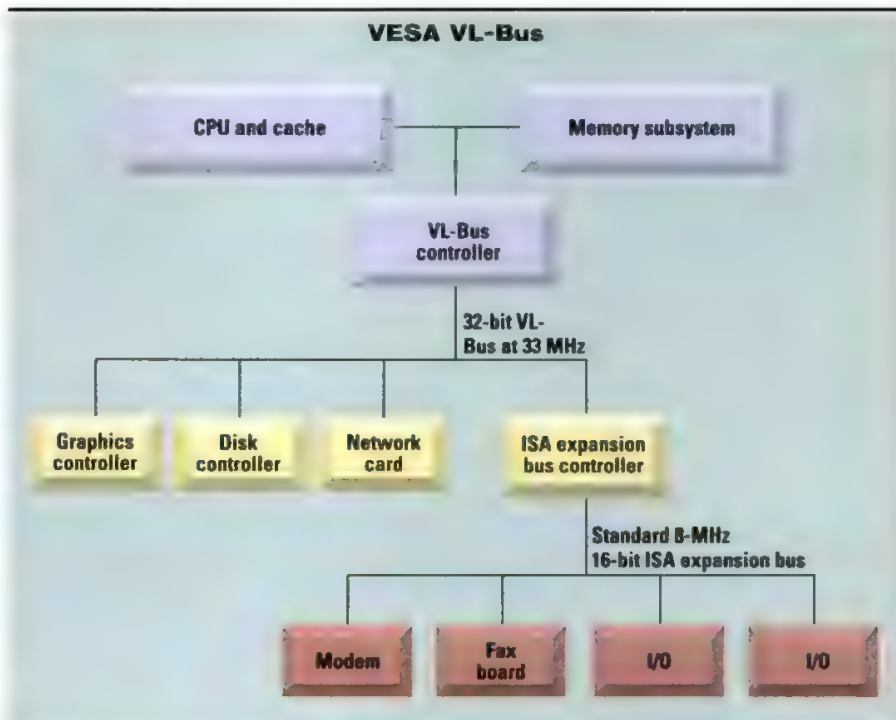
One unique local-bus system we evaluated was Northgate's SlimLine ZXP 486/33. It is the first ISA PC to implement Headland Technology's local-bus video solution. Priced at \$2,349 with a 120MB hard drive, 4MB of DRAM, one floppy drive, and a 14-inch Super VGA monitor, the ZXP is based on a Headland chip set combined with Headland's HT216 video controller. The HT216 resides on the motherboard, accompanied by 1MB of DRAM display memory.

More of an intelligent processor than a full-blown GUI accelerator, the HT216 lacks a BitBlt (bit-block transfer) engine but has some built-in features, including Windows' raster operations and a 32-by-32 pixel hardware cursor. The controller includes a 32-bit display memory path and internal caches to improve the bandwidth of the chip.

On the other hand—like the Tseng and S3 controllers—the chip is limited in its local-bus capabilities. It can only handle a 16-bit data bus connection and, because it was originally designed for 386SX CPUs, it may take up to five clock cycles to interact with the 33-MHz 486.

Despite the lack of a full BitBlt engine and the bottleneck at the bus connection, the Northgate system did well enough against the ET4000 and 86C911 local-bus video designs, posting 8.37 Winmarks in Super VGA mode.

All three controllers—the Tseng ET4000, the S3 86C911, and the Headland HT216—face difficulties on the local bus. Not one was originally designed to manage the influx of data that a fast 32-bit CPU's bus presents. The next gen-



eration of these controllers promises more. All three chip makers have announced new 32-bit chips with added features designed for the local bus.

PLAYING WITH MEMORY

Based on a proprietary removable processor card, Dell Computer's 450DE/2 DGX EISA PC proved one of the best video performers in our tests. It had the

fourth-fastest Winmark scores in Super VGA and 1,024-by-768 modes, posting 14.41 and 14.92 million, respectively.

Dell's design depends not so much on putting the video controller on the local bus as it does on eliminating it altogether. (Well, nearly. To maintain VGA compatibility, a Tseng ET4000 controller rests on a small daughtercard using a 16-bit path to the expansion bus.) The key to the 450DE/2 DGX's speed is a memory maneuver called *linear addressing*.

In standard PCs and in all preceding local-bus systems, the CPU is able to use only a small portion of its memory—64K—to move graphics instructions

through to the graphics controller. To move the amount of information required by high-resolution graphics, the instructions are divided up into overlapping pages. This wastes CPU resources (it has to make additional calculations to divide up the image) and graphics controller resources (it has to store and then rebuild the image before sending it out to the monitor).

Like the Compaq QVision's linear addressing scheme, Dell's DGX system tricks the CPU into assigning a larger portion of RAM (2MB) as contiguous display memory. But unlike the Compaq system, which must cross the expansion bus, Dell's linear addressing takes place right on the local bus. All the graphics rendering is performed by the CPU and written directly to VRAM on the processor card—without the interference of a graphics controller or accelerator. Dell's DGX software drivers ensure that everything runs smoothly.

Since the Dell PC uses a 50-MHz 486DX2 (running at 25 MHz externally and 50 MHz internally), and since the CPU is responsible for the video calculations, its results cannot be directly compared to the other systems tested. Nevertheless, the advantage of this approach is that because it relies on the CPU rather than a fixed-function accelerator, the DGX should perform equally

*Local-bus versions of
the S3 86C911 GUI
accelerator are
decisively faster under
Windows than designs
using the Tseng
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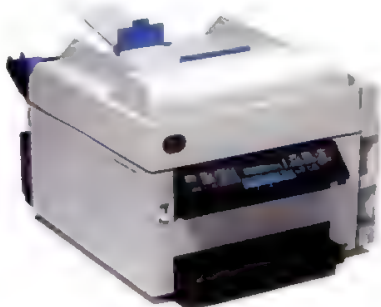


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ERS. PAGES AHEAD.



Benchmark Tests: Local-Bus Video

Under Windows, no system came close to the performance of the Mach 32 chip used in both the local-bus and ISA cards from ATI. Local-bus versions of S3's 86C911 GUI accelerator proved faster under Windows than local-bus designs using the Tseng ET4000, but the Tseng chip benefits from the local-bus connection to a greater degree.

HOW WE TESTED

Because this review covered both complete PCs and add-in boards, we used several test-beds. In most cases, the systems had 8MB of RAM, an Intel 486/33, and RAM caching enabled. The Dell 450DE/2 DGX, however, had 4MB of RAM and used a DX2 chip running at 25 MHz externally and 50 MHz internally.

We ran PC Magazine Labs' standard video test suite on each device to obtain the Graphics Winmark and video benchmark test scores. Some of the products were still in preproduction, so the performance may change by the time the final products ship.

ATI Technologies' ISA and local-bus add-in prototype boards (based on its Mach 32 chip) and Tseng Laboratories' local-bus prototype board (based on its ET4000 chip) were tested on a VL-Bus-compliant motherboard, which was provided by Micronics Computers.

The Compaq QVision 1024E (which uses Compaq's own video chip) and the Orchid ProDesigner IIs EISA (which uses the Tseng ET4000 chip) are both EISA video boards and were tested in a Compaq Deskpro/M 486/33.

The CSS Preferred 486/33GA uses S3's 86C911 chip in a proprietary local-bus add-in board implementation. The Swan 486/33DB PC provides local-bus abilities via a proprietary add-in board that uses the same S3 video chip.

The IBM PS/2 Model 90 was equipped with IBM's plug-in XGA board.

The NEC PC employs the Tseng ET4000 video chip on the motherboard for its proprietary local-bus design. The Northgate SlimLine ZXP 486/33 employs a Headland HT216 video chip on the motherboard in a proprietary local-bus implementation.

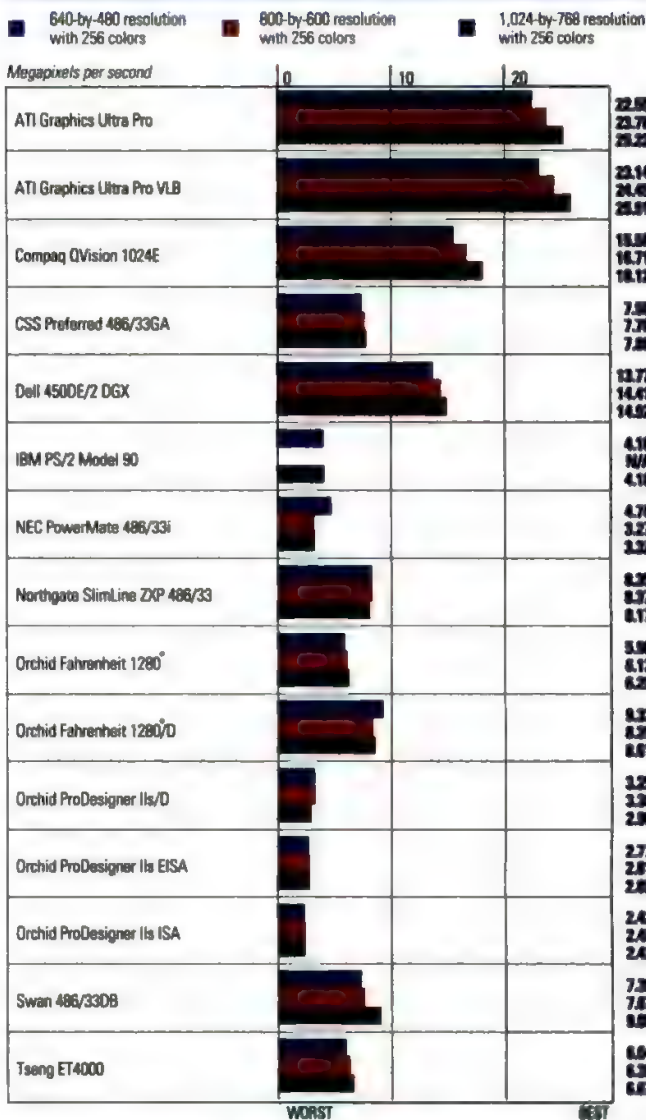
The Orchid Fahrenheit 1280° and the Orchid Fahrenheit 1280°/D proprietary local-bus add-in boards (both use the S3 86C911 chip) were tested on a Polywell Computers system. The motherboard in the Poly 486-33L is Orchid's own. The Orchid ProDesigner IIs/D and the Orchid ProDesigner IIs ISA local-bus add-in boards (both use a Tseng ET4000 chip) were also tested on the Polywell.

The proprietary design of the Dell 450DE/2 DGX, an EISA PC, puts the Tseng ET4000 chip on a daughtercard. Since this system was the only non-33-MHz processor in this test, its test results are not completely comparable with the others.

The **Graphics Winmark** is the geometric mean of 12 WINBENCH graphics tests, measured in millions of pixels per second. PC Labs profiled the major Windows applications in November 1991 and determined which graphics functions are most frequently used within Windows. The Winmark takes into account 12 tests of these key functions and weights them to reflect how frequently the functions are used.

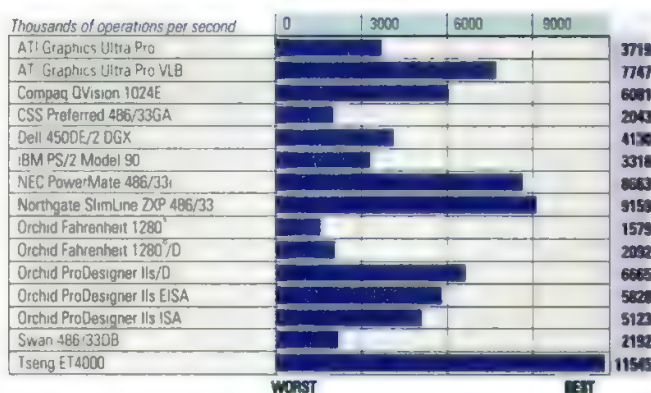
The **video** benchmark test consists of a series of text- and graphics-oriented tasks that exercise the video chip's VGA section. These tests include scrolled and unscrolled BIOS writes; screen fills using 8-bit, 16-bit, and 32-bit writes; and BitBits (bit-block transfers).

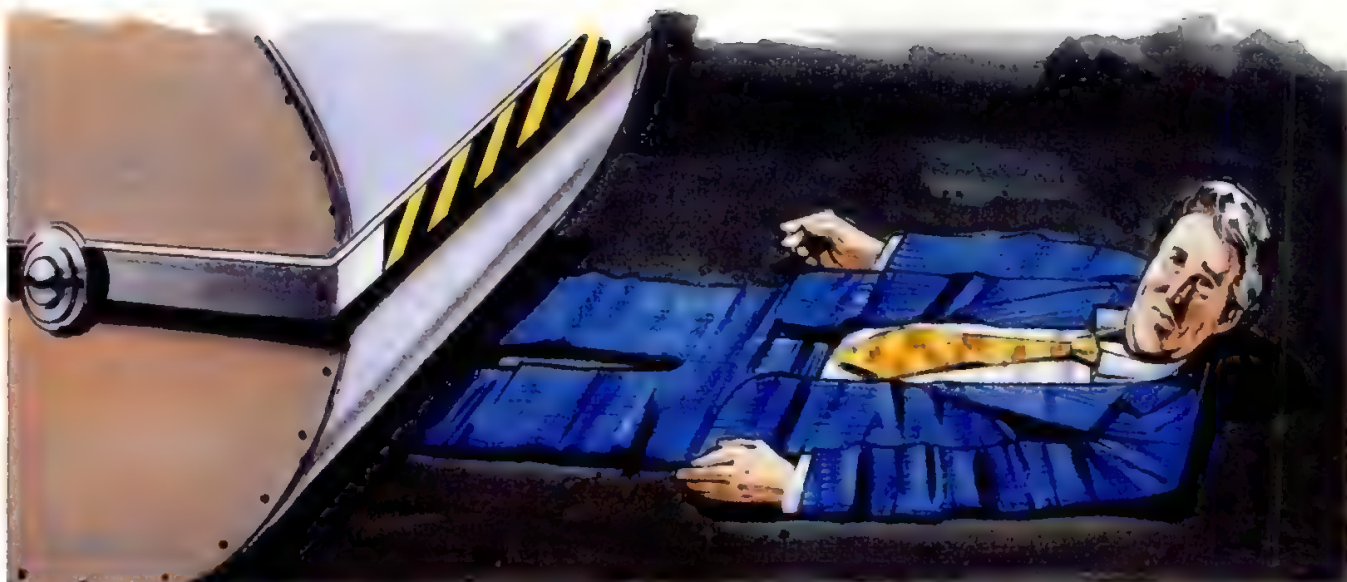
GRAPHICS WINMARK



N/A -- Not applicable. The IBM XGA adapter in the IBM PS/2 Model 90 does not support Super VGA mode.

VIDEO





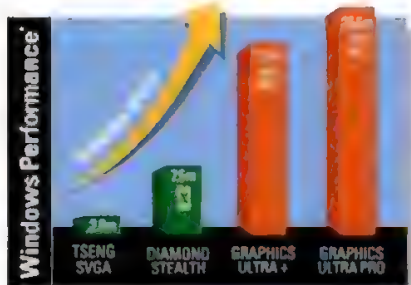
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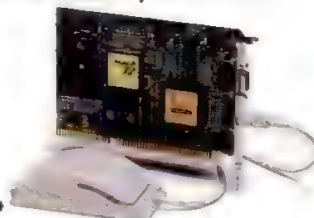
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HARDWARE

Local-Bus Video

well in different graphical environments.

But this boost in performance has a steep price. With 4MB of DRAM, an 80MB hard drive, a 1.44MB or 1.2MB floppy drive, and a 16-inch Super VGA monitor, the Dell system costs \$4,319.

Another linear-addressing scheme expected to make inroads in the graphics market is Chips & Technologies' 64200 Wingine video chip. Though we were unable to obtain a system for testing, several PC makers are expected to introduce units using this system board-level approach to linear addressing.

A LOCAL-BUS STANDARD?

All of the local-bus designs discussed so far have one shortcoming: They are all proprietary schemes. VESA wants to end all that with its new local-bus standard, the VL-Bus. With support from video

manufacturers like Tseng, ATI, and Orchid, the standard promises upgradable parts and a choice of vendors. Initially, VL-Bus PCs will undoubtedly command a premium, but motherboard makers ex-

pect the cost difference to be around \$100, and peripheral vendors say they will be able to sell VL-Bus video adapters for only \$20 to \$50 more than standard ISA parts.

In a standard VL-Bus configuration, a short 32-bit MCA-

style connector sits in line with a standard 16-bit ISA expansion slot. The VL-Bus connector hooks into the local bus with the help of additional core logic, allowing up to three peripherals to be connected to the 32-bit CPU-speed local bus.

Typical VL-Bus devices plug into the 112-pin MCA-style connector at one end and into the ISA connector at the other. If you only use one VL-Bus device, the

Far and away the fastest local-bus design we looked at was the VL-Bus video adapter from ATI.

■ Hopping on the VL-Bus

In addition to the products discussed in this story, at press time the companies listed below either had VESA-compliant devices or anticipated having them before the end of the year.

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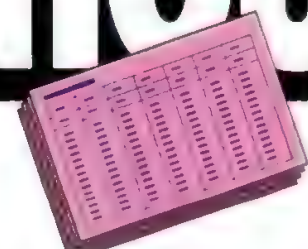
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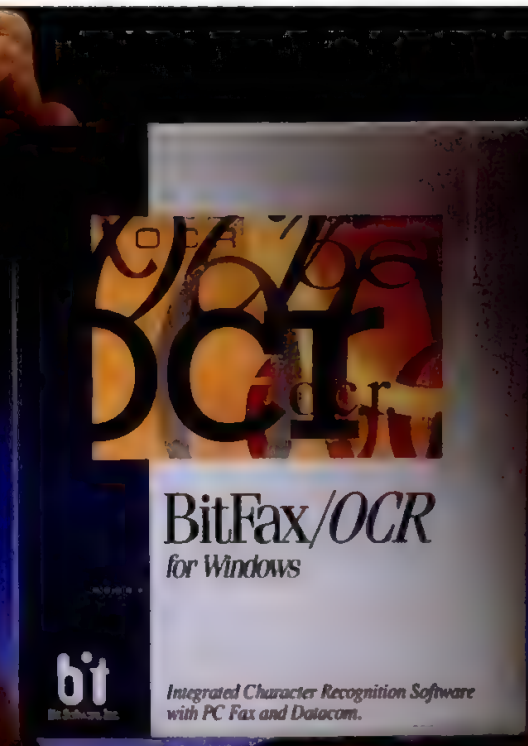
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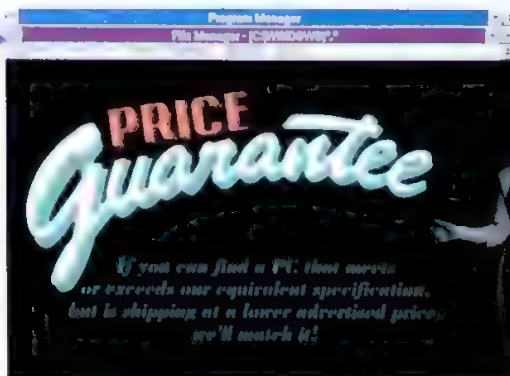
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386SXL/25	386SXL-25 MHz Optional 80387SX	2 standard 4 & 6 options	80	3+	\$1,599 \$59/mo*
386SL/25	Intel 80386SL-25 MHz 64 K CPU cache Advanced SL power mgt. Optional 80387SX co-processor	2 standard 4 & 6 options	80	3+	\$1,799 \$67/mo*
486SX/25	Intel 80486SX-25 MHz Built-in 8K CPU cache	4 standard 8 & 20 options	80	2.5+	\$2,199 \$84/mo*
486DX/33	Intel 80486DX-33 MHz Built-in 8K CPU cache	as above	130	2.5+	\$2,899 \$107/mo*



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CIRCLE 357 ON READER SERVICE CARD

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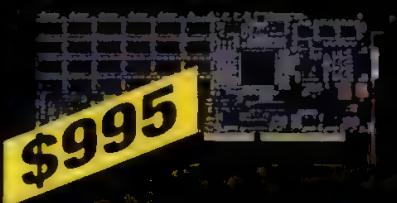
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Impression 1024 Fact File

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Speed	3x to 10x Super VGA
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Warranty	5 years
Price	\$995



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CIRCLE 42 ON READER SERVICE CARD

other two local-bus slots can still accept ISA adapters. The ISA part of the connection can give VESA-compliant peripherals direct memory access (DMA) and access to interrupts, port addresses, and power through the ISA bus.

The VL-Bus specification has two additional benefits. It provides a standard for local-bus timings and allows bus mastering (a scheme that lets a peripheral take control of the bus temporarily) of up to three devices running at speeds between 16 MHz and 33 MHz. Any peripheral that can use the additional bandwidth or bus-mastering capabilities of the VL-Bus is a candidate for the local bus. Such peripherals currently include hard disk controllers (particularly SCSI-2), audio boards, network adapters, and full-motion video compression/decompression boards.

The VL-Bus, despite its benefits, still won't completely remove PC bottlenecks. Operating three data-hungry local-bus peripherals could significantly slow performance. So VL-Bus peripherals still need to be optimized to perform at the CPU speed without wait states.

A LOOK AT THE FUTURE

For a preliminary evaluation of VL-Bus video performance, PC Labs tested an engineering sample of a VL-Bus system board built by Micronics Computers. The system board is based on Micronics' Gemini core logic with a 33-MHz 486 and a 256K external SRAM cache. The motherboard has five standard 16-bit ISA slots, two VL-Bus slots, and a local-bus IDE (integrated device electronics) controller. PC Labs tested two graphics adapter VESA prototypes: the Tseng ET4000 reference sample described above, and ATI Technologies' Graphics Ultra Pro VLB.

Far and away the fastest local-bus design we looked at was the prototype VL-Bus video adapter from ATI. Using preliminary 32-bit Super VGA Windows software drivers from ATI, the Graphics Ultra Pro VLB turned in the highest Winmarks yet recorded in PC Labs: 24.45

million. In 1,024-by-768 mode, the adapter continued unrestrained, logging a stunning 25.91 Winmarks.

The adapter is based on ATI's Mach 32 Graphics Controller, a 32-bit controller that can handle 64-bit instructions internally and that packs nearly every cur-

rent speed-enhancing graphics maneuver onto a single chip. A graphics-accelerator section includes a BitBlt engine, a 64-by-64 pixel hardware cursor, line draws, area fills, and a hardware cache. Through software, the Graphics Ultra Pro VLB

also allows you to set a linear addressed display memory, or "memory aperture," of up to 4MB (though the board comes with 2MB of VRAM). Font caching is also included.

How much of this stellar performance is due to the VL-Bus architecture and how much is due to the abilities of the

Mach 32? Tests conducted on the Graphic Ultra Pro, which is ATI's ISA prototype using the Mach 32 chip, yielded a Super VGA Winmark of 23.78 million—very close to the local-bus model's score. In 1,024-by-768 mode, the numbers were even closer.

The absence of a significant performance difference between the two Winmark results may be because of a number of factors. It's possible that in this initial sample unit, the PC's VL-Bus controller introduced a little overhead of its own. Furthermore, all the components were prototypes, and according to ATI, its software drivers were not yet optimized for the Graphics Ultra Pro VLB.

To see how much the raw throughput was affected by the accelerated Windows functions of ATI's Mach 32, PC Labs tested the two versions of the Graphics Ultra Pro using older ATI and plain Windows VGA drivers. In effect, this disabled the chip's accelerated functions to reveal the effective throughput of the local bus versus the ISA bus. The results of this informal test confirmed our suspi-

*Whether the VL-Bus
will take hold as a true
standard remains to be
seen. Naturally, there
will be competition.*

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HARDWARE

Local-Bus Video

cions, showing a nearly 2-to-1 gain of the local-bus version over the ISA version.

Although all of ATI's final prices have not yet been determined, its ISA version with 2MB of VRAM will initially retail for \$799. If the prototype is any indication, it's a small price to pay for the fastest ISA-based desktop video available.

Whether the VL-Bus will take hold as a true standard remains to be seen. The VL-Bus specification should be ratified by VESA's full membership this fall. Several chip makers (including Chips & Technologies, OPTi, and Appian) are committed to supporting VL-Bus core logic, and according to VESA, a number of system-board manufacturers (including Everex, Genoa, DFI, and, of course, Micronics) have already announced their support. So far, the VL-Bus looks to be an inexpensive and straightforward addition to the ISA foundation offering com-

plete backwards compatibility.

Naturally, there will be competition.

On the video side, IBM's XGA specification is still lurking in the background. IBM's XGA adapter is basically a video accelerator that offers bus mastering. Acceptance of XGA has been slow, however, because it has a proprietary color mapping scheme, interlaced resolutions, and no software to take advantage of the bus mastering. Additionally, on our tests, the performance of the XGA adapter in

the \$4,495 IBM PS/2 Model 90 was not impressive. Intel has promised to work with IBM on the specification, though, and several adapter makers are expected to introduce XGA-compatible cards.

On the bus-architecture side, Compaq is refining its approach with a design called TriFlex. High-end TriFlex PCs will have three buses: a 64-bit wide CPU bus, a 128-bit system-memory bus, and a

standard 32-bit EISA bus. To arbitrate among the three buses, a buffered controller will play traffic cop.

Though Compaq would not comment on design specifics, the increased data path of the CPU bus is undoubtedly a nod toward Intel's next CPU, currently known as the P5. Not scheduled for release until the beginning of next year, the P5 will be able to take advantage of a 64-bit data path.

Meanwhile, Intel itself is working on its PCI local bus architecture (see the sidebar "PCI: The Next PC Architecture?"). It expects to have its proposed specifications finalized by the time the P5 is released.

Though local-bus technology offers significant performance gains, its acceptance in the marketplace is difficult to predict. After all, we need only recall that when the MCA and EISA architectures were introduced, many consultants hailed the death of the ISA bus. □

JOHN R. QUAIN IS A FREQUENT CONTRIBUTOR TO PC MAGAZINE.

Intel's specs for the PCI local-bus architecture should be finalized by the release of the P5.

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March 1992
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ASYNCHRONOUS
COMMUNICATIONS SERVERS

Dialing in At Large

These products are the simplest, least expensive way yet to hook up to a LAN from wherever you may roam.

*by Frank J. Derfler, Jr., and
Susan G. Thomas*

It seems as though everybody is out of the office. More than 25 million U.S. workers are mobile, according to the Department of Labor, and nearly four million Fortune 1000 employees work at remote sites, according to Forrester Research. Many of these workers require steady contact with their central offices and want better connections to company LANs. What's the best way to stretch your office LAN to accommodate far-flung employees?

You could equip every employee's PC with a modem and some remote-control software. Even better, you could install an asynchronous communications server. But you will have to pay a bundle, and

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you will have to teach everyone how to use the new system.

Enter remote-client servers, a new breed of asynchronous communications servers. Well, sort of new, anyway. Actually, remote-client technology is an old solution long offered in NetWare 2.x and only more recently making a comeback in NetWare 3.11 environments, thanks to today's high-speed modems.

Remote-client products extend the LAN across ordinary telephone lines, and they are wonderfully simple to use. Attach them directly to the network and dial away; there are no complicated software programs to learn. And at an average price of about \$1,500, remote-client products are less expensive than most other asynchronous communications servers.

REVIEW CRITERIA

Theoretically, any solution that allows you to dial into or out of the LAN from a remote site is an asynchronous communications server. We decided to review remote-client servers. In addition to being simple to use, they are relatively inexpensive and offer transparent access to the LAN. No matter where you are, these products can connect you to the office LAN as if you were attached locally; they treat your remote PC as an actual node on the office network. Remote-control software does not give you this functionality, and it is difficult to use. Multi-processor asynchronous communications servers can cost as much as a new Mercedes (and can be trickier to maintain.)

We found three remote-client servers that fit our criteria: the Shiva NetModem/

E, the Microtest Lanmodem, and DCA Remote LAN Node (RLN) from Digital Communications Associates. All three operate under Novell NetWare 3.11 and Ethernet, transparently and inexpensively.

We considered testing Cross+Connect Modem Share from Cross Communications Co., MultiModem LAN from Multi-Tech Systems, and the NetBlazer 40 from Telebit Corp., but ruled them out because they dial out only. We also considered UDS Motorola's LANFast DM20 for Ethernet and DM25 for Token-Ring, but these products are identical to Microtest's Lanmodem family (Microtest uses UDS Motorola's modem, and UDS uses the remaining software and hardware from Microtest). We decided to review the Lanmodem, since more components

HIGHLIGHTS

Remote-Client Servers

THREE ASYNCHRONOUS DIAL-IN

products are reviewed here; two of them, the Shiva NetModem/E and the Microtest Lanmodem, are network modems. All provide transparent access to NetWare networks, allowing a remote PC to dial in, act as a network client, access server volumes as virtual drives, and use the COPY command to transfer files.

THERE ARE TWO basic dial-in solutions: remote-client software and remote-control software. Remote-control software processes all data locally on the LAN and sends only keyboard and screen changes to the remote client. Remote-client software processes all data on the remote PC, sending all network traffic across the dial-up line. Remote-control software is the best choice if you have your applications residing on the network. Remote-client software is best if you have the applications residing on the client and the data residing on the LAN.

REMOTE-CONTROL software may run on a single PC, a multiple-CPU system, or a multitasking system. These products are designed to run applications from the network over a dial-in con-

nection, but usually with some loss of transparency.

ETHERNET AND NETWARE SUPPORT

are offered by all the products we review. The Lanmodem also offers Token-Ring. The NetModem/E supports AppleTalk; DCA Remote LAN Node (RLN) is protocol-independent; it supports many operating systems, including NetWare, LAN Manager, and VINES. The Lanmodem connects two simultaneous callers and the NetModem/E only one; RLN can support up to 16.

DIAL-OUT AND REMOTE-ROUTING

features are included in the Lanmodem and NetModem/E, but not in RLN. Dial-out capability allows a group of network users to share a modem, or pool of modems, on a network. Remote routing lets them access the resources of another network outside their own, across a phone line.

THE FASTEST product on three of our dial-in tests (the two I/O Throughput tests and the Windows-File Retrieval test) was RLN; the NetModem/E had the edge on the Large IPX Packet test. The NetModem/E beat the Lan-

modem across all the tests, including the Remote Routing tests, in which only the two of them competed. RLN does not support remote routing.

THE LEAST-EXPENSIVE product was RLN, at \$795 for a two-user version, but that price doesn't include the modem or dedicated server PC it requires. The NetModem/E and Lanmodem are self-contained modems and servers, but they cost \$1,699 and \$1,995 respectively (\$2,595 for the Token-Ring version of the Lanmodem).

ADMINISTRATIVE TOOLS for these three products are still somewhat rudimentary, particularly in the ability to compile periodic reports of user log-ons and error messages and to set times for log-ons.

NOVELL, BANYAN, AND MICROSOFT make their own dial-in solutions for NetWare, VINES, and LAN Manager. Their products guarantee you a similar interface, compatibility with their network operating systems, and a single source of support if something goes wrong. But you don't get the modem integration of the NetModem/E and Lanmodem or the versatility of RLN.

of the Lanmodem/LANFast product can be credited to Microtest.

We also considered Citrix Systems' Citrix A+ Remote, which supports up to 20 concurrent users. It dials in to a NetWare network, runs DOS or OS/2 apps, and lets you toggle between multitasking apps by hotkey. Although A+ Remote is nearly transparent, you still must use Upload and Download commands to transfer files, instead of the familiar DOS COPY. Another product, the Shared Access Modem Sharing Kit from U.S. Robotics, dials into and out of the network, but its dial-in facility is not transparent.

SIMILARITIES AND DIFFERENCES

While each product we review provides transparent access to LANs, they differ in the types of networks and number of users they support.

The NetModem/E and Lanmodem are similar in their construction and their components. They're both small, self-contained units that pack a V.32/V.42bis modem and a connection for dial-in and dial-out service to and from the network.

DCA RLN is different. It requires a dedicated PC loaded with its own software, an Intelligent Multi-Port Adapter (IMPA) for more than two simultaneous connections, and anywhere from 2 to 16 modems (you foot the bill for the modems). And RLN only allows you to dial into the network; you can't dial out.

The NetModem/E and the Lanmodem both function as routers, connecting at least two networks: one an Ethernet or Token-Ring segment, the other an asynchronous line. Like all routers, these products recognize the network address of a frame on one LAN and then route that frame to the appropriate station on an adjoining line. But as routers, these products are sensitive to the particular network protocol running on the LAN. Both support Novell's IPX (Internet Packet Exchange), but only the NetModem/E will support Macintosh computers through the AppleTalk protocol. Both products run across Ethernet, and the Lanmodem supports Token-Ring.

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EDITORS' CHOICE

Which remote-client server is the best?

Unfortunately, there's no simple answer. You can use any of the products we review as a remote-client server, yet each lacks at least some of the critical

features it would need to win Editors' Choice.

Each product excels in a different area. In performance, security, and manageability, DCA Remote LAN Node gets the nod. RLN showed better performance on two of our throughput tests. It has the best call-tracking features of any of the products and works in more networking environments than the Microtest Lanmodem or the Shiva NetModem/E.

But if you want a simple solution for dialing in and out of the LAN, you'll want the NetModem/E. Like the Lanmodem, the NetModem/E is a self-contained unit that plugs directly into the network; unlike the RLN setup, configuring a PC is not necessary.

The NetModem/E and the Lan-

modem let users dial into and out of the LAN. Though the NetModem/E was slower than RLN on most tests, it was superior to the Lanmodem, taking ten seconds less to transfer a Microsoft Excel file.

The NetModem/E's major weakness is its lack of management features: It provides absolutely no call-tracking or logging. The Lanmodem does compile an ASCII file of call activity that can be exported to another application and printed. Its log function can also detect and report accurately on interrupted and reestablished connections.

The NetModem/E supports only the one modem that comes with it; the Lanmodem supports an additional modem, so two users can simultaneously dial in or out of the LAN.

RLN functions as a bridge, not a router. RLN also works with a variety of network operating systems, including VINES, Microsoft LAN Manager, and NetWare, as well as a number of protocols, such as IPX, NetBEUI, and TCP/IP (Transmission Control Protocol/Internet Protocol), and others.

The NetModem/E has one asynchronous port so it can connect only one user at a time; the Lanmodem offers an extra asynchronous port to support two simultaneous users. RLN tops the list with support for 16 users.

While they provide by far the simplest remote connectivity to the LAN, the chief deficiency of remote-client servers is the lack of administrative tools. With the NetModem/E and RLN, for example, there is no easy way to track the number

of successful connections or log-on attempts, nor any way to generate weekly or monthly report logs. The Lanmodem's administrative tools are a bit better than the NetModem/E's (you can generate and print weekly reports), but are far from ideal. You can't set log-on times, and the software does not support Windows. These products also limit your choice of communications packages.

WHY REMOTE CLIENT?

Besides using a remote-client server, you can also dial up a network from a remote location through remote-control software on a PC, on a multiprocessing communications server, or on a multitasking communications server. All four options allow you to access the LAN's e-mail system, printing services, and data files.

One difference between remote-client and remote-control programs is that remote clients are easier to use and install. But the major difference between remote-client servers and other asynchro-

Suitability to Task: Remote-Client Servers

Network administrators and remote and local users need remote-client servers for different reasons. Transparent network access and Windows compatibility benefit remote users. For network administrators, security and manageability are important concerns. And for all these groups, product reliability is critical. Our Suitability to Task scores are informed, subjective ratings of these products' abilities. Compare the scores with the features table, performance test results, and accompanying reviews to get a better idea of the strengths and weaknesses of these products.

Transparent network access rates each product's ability to access a network server as though it were a virtual drive. A remote-client server should allow you to use standard DOS commands for operations such as copying files from the server to your remote machine; you should not need to modify any commands or use a menu. You should be able to run applications transparently and access files through standard path specifications.

Windows compatibility refers to the product's ability to work with Microsoft Windows 3.1. At a minimum, the product should allow you to run a Windows application such as Microsoft Excel on your local machine and access files reasonably quickly from a remote server over a phone connection. Windows-specific versions of the product's software, support for the Windows 3.1 COMM driver, and the ability to run Microsoft Windows itself from the remote server without long screen updates add to the score.

Security represents the product's ability to protect against unauthorized access to the communications server. At a minimum, the product should include

SUITABILITY TO TASK				
Product Name	POOR	FAIR	GOOD	EXCELLENT
Transparent network access	●	○	○	○
Windows compatibility	●	●	○	○
Security	●	●	●	○
Manageability	●	●	●	●
Reliability	●	●	●	●

password and dial-back features. Extras that add to the score include support for encryption and the ability to establish security levels and privileges for users or groups and to designate directories as off-limits to certain users or groups. Other pluses are the ability to set the number of failed log-on attempts allowed before automatic disconnection and support for attachments to the parallel port that restrict remote network access only to PCs with matching attachments.

Manageability reflects the product's ability to detect problems and notify the network manager for corrective action. Important management features include the ability to create a user database, compile user profiles, set specific times when users can log on, generate a status log of connections made and lost, compile weekly reports, and track the number of packets sent and received. Support for the Simple Network Management Protocol and the ability to sort through and view errors in the logfile are also pluses.

Reliability indicates how well-made the product is. For hardware, surface-mount technology, shock-resistant casing, and minimal heat generation are pluses. Software should support troubleshooting and be bug-free. The product should let an administrator log in remotely, run the NetWare MAP command, and reconnect automatically if a faulty connection interrupts the session. The program should display an error message, then store it in a log file.

nous servers lies in where they process applications. Remote clients generate and process all requests at the remote site, treating the remote PC like a node on the network. Other asynchronous servers process all requests on the LAN; your PC becomes a dumb terminal mimicking a PC at the office.

Remote-control packages, such as Microcom's Carbon Copy, Triton Technologies' CO/Session, or Symantec

Corp.'s Norton pcAnywhere, actually take over the networked PC. Code that runs on the networked PC passes screen images to the calling PC, which in turn sends keystrokes to the networked PC. The advantages of this approach are its speed and the efficiency of keeping all active files in one place: on the LAN.

Running remote-control software on each employee's PC is fine for small networks. But when you've got dozens of us-

ers demanding access to the network, equipping them with separate PCs, each with its own remote-control software, is just too expensive. (For more information, see "Modem Remote-Control Software," *PC Magazine*, February 25, 1992.)

Servers that combine multiple processors or use a multitasking operating system to simulate multiple processors are the fastest, most reliable, and secure choice. They will hit your budget the hardest, though: These servers can run more than \$2,000 per communications line; fully configured, one could even cost you as much as \$40,000.

JUST FOR THE SPEED OF IT

Remote-control servers are faster than remote-client servers, but the technology that the NetModem/E, the Lanmodem, and RLN use helps recover some of the speed difference. The NetModem/E and the Lanmodem use V.42bis compression in their firmware to improve throughput, and they support Novell's Large Internet Exchange Packet (LIEP) to stream data across the link more efficiently.

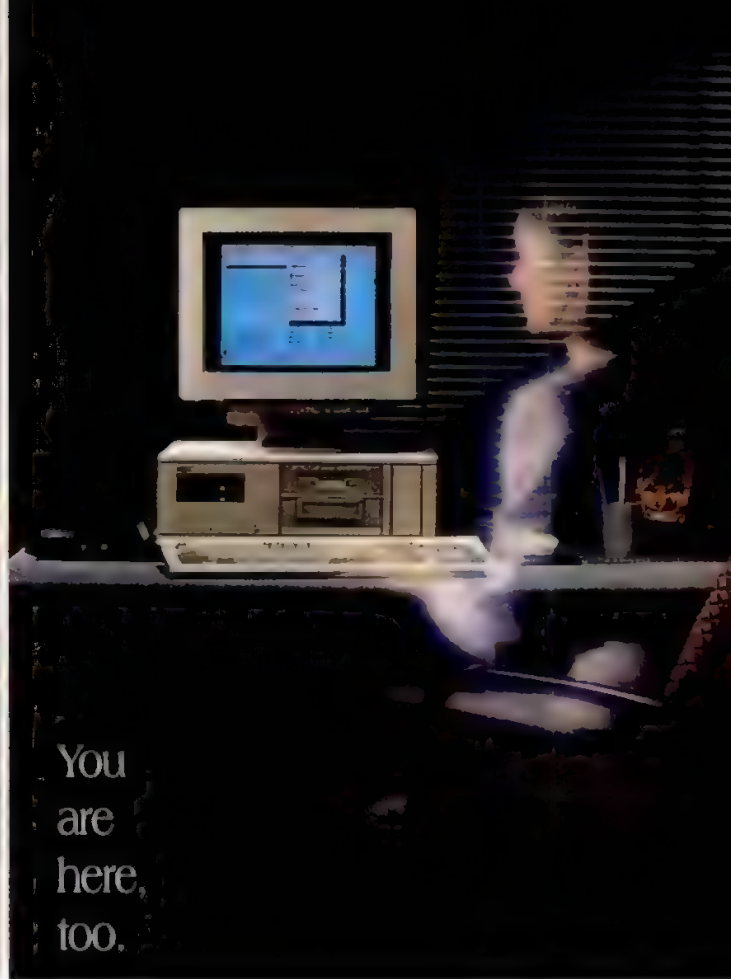
DCA's RLN uses the Internet's Point-to-Point Protocol (PPP). PPP employs tokenizing, which reduces IPX's repetitive header, and compression techniques that whittle down network packets to their most compact and efficient sizes. These techniques include Tinygram Compression, which strips the trailing zeros from any minimum-size packet; Header Compression, which, like tokenizing, compacts redundant and unnecessary data in a header; and Protocol Length Compression, which reunites large packets broken up for transmission.

PPP doesn't cope with error handling, so you still need to use RLN with a modem that has V.42 or MNP (Microcom Networking Protocol) services to ensure the integrity of the data.

DIAL-OUT DIFFICULTIES

Dialing in to a network is a fairly straightforward procedure. Dialing out, however, is a tricky business, especially with remote-client products or shared modems. And the upshot is that remote-client products can seriously limit your choice of communications programs.

Most communications programs are written to access the computer's serial port directly, which is fine for PCs with



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standalone modems. It is not fine for networked modems or remote clients; a connection will not be made. These products need software or hardware to redirect calls made by the comm software to the modem across the network.

Shared modems depend on communications software that supports Microsoft's function call interrupt 14h or a similar network service called Network Asynchronous Server Interface (NASI), developed by Novell, which uses interrupt 6Bh. With either of these interfaces, special software can redirect a call across the network to the Shiva and Microtest products. The software, which loads as a TSR (roughly 20K), moves data from interrupt 14h or 6Bh to the network driver and vice versa.

Fortunately, now that more users are running communications programs over networks, vendors are building in support for these industry-standard communications interfaces. For example, in our recent review of 23 general-purpose communications programs, 14 supported interrupt 14h and NASI, and five offered only interrupt 14h drivers. (See "Modem Communications Software: Too Hard to Use?" *PC Magazine*, June 30, 1992).

As our review indicated, not all communications programs support these two interfaces. You cannot, for example, use e-mail packages such as MCI Mail with Lotus Express, or some special-purpose comm packages used for accessing commercial databases, such as Lexis.

You won't get much further by trying a hardware redirector instead of a software redirector. There are several companies, including J & L Information Systems and D-Link Systems, that sell hardware redirectors, which can be plugged into the expansion bus of any PC needing shared modem services. Because these redirectors emulate communications ports, they'll work with any communications software. However, these redirectors work only with proprietary communications servers, and don't offer a way to use standard programs with the network modems in this review: the NetModem/E and Lanmodem.

PURCHASING CRITERIA

How should you go about purchasing a remote-client server? First, decide whether or not you need both dial-in and

► BENCHMARK TESTS

Remote-Client Servers

These products have various strengths and weaknesses. On a standard NetWare network, DCA Remote LAN Node (RLN) gives the best performance on most of our dial-in tests. But only the Shiva NetModem/E can take advantage of NetWare's BIGPACK.NLM to dramatically boost performance across the asynchronous line.

Each of these products aims to give the remote user the impression of working locally on the network. Although none of the products was able to compensate fully for the differences in speed between a dial-up line and a high-speed network, DCA Remote LAN Node (RLN) came closest, with 12 kilobits per second of throughput on the 10K and 50K Throughput tests. But that speed was only marginally better than the Shiva NetModem/E (11 Kbps) and the Microtest Lanmodem (8 Kbps). The performance difference between RLN and the other products is largely attributable to the Compaq Deskpro 386/25e on which RLN was installed and to the Intel 14.4EX modem that DCA supplied. RLN also uses a proprietary data-compression algorithm that works in tandem with the V.42bis data compression built into many modems.

Part of the speed gap between the NetModem/E and the Lanmodem is caused by the performance of their modems as well. The NetModem/E uses a data pump from the Hayes Ultra 144 modem and V.42bis data compression and V.42 error-control firmware that it fine-tunes for its product. The Lanmodem relies on data-compression and error-control firmware provided by UDS Motorola.

One way to improve the throughput of these products is to enable them to handle packets more efficiently. The products in this review use one of two protocols across the wide-area link: SLIP (Serial Line Interface Protocol) or PPP (Point-to-Point Protocol). RLN and the NetModem/E use

PPP; the Lanmodem relies on SLIP. These protocols can support only a 512-byte packet size. Thus, large NetWare frames must be fragmented into smaller frames, reducing the effective throughput.

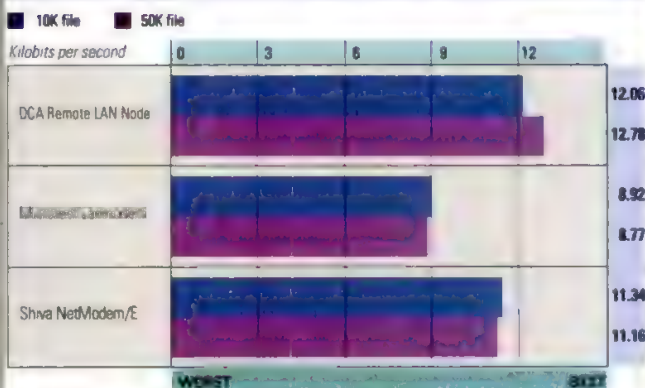
Novell solves this problem with BIGPACK.NLM, a file server-based application that allows a communications server to negotiate the number of packets sent without an acknowledgment, simulating a large packet size and increasing throughput. Only the NetModem/E was able to take advantage of the NLM, outperforming even RLN.

The type of modem used also affected the performance of the NetModem/E and the Lanmodem on the routing tests. RLN does not allow you to dial out of the LAN and therefore could not participate in this test. With the help of the data pump from the Hayes Ultra 144 modem and Shiva's own technology, the NetModem/E registered another 3 Kbps of throughput more than the Lanmodem.

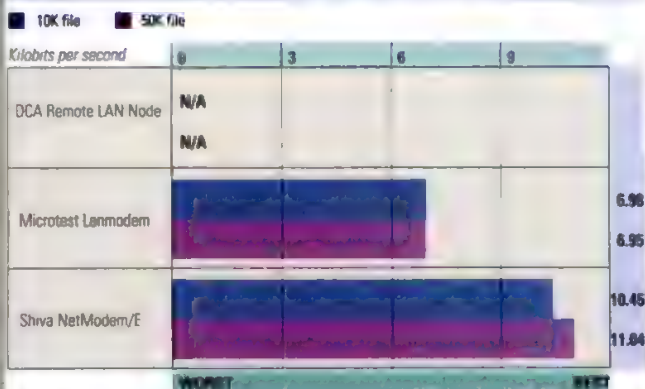
Results on the Windows File Retrieval test were much the same as on the I/O Throughput tests. RLN's and the NetModem/E's times were very close, with RLN three seconds faster than the NetModem/E. The Lanmodem wound up 10 seconds behind RLN. Again, we suspect that the modem and dedicated server used with RLN largely accounted for the difference in speed, along with its proprietary data-compression algorithm. The NetModem/E held the edge over the Lanmodem, again because of the algorithms in its firmware.



I/O THROUGHPUT

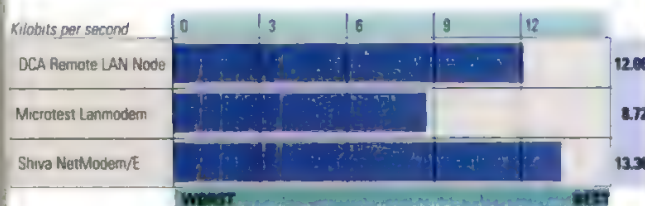


REMOTE ROUTING

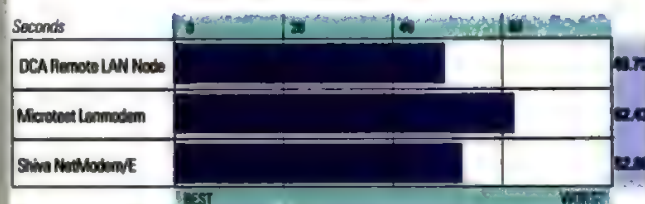


N/A—Not applicable: This product does not perform remote routing.

LARGE IPX PACKETS



WINDOWS FILE RETRIEVAL



HOW WE TESTED

We used two methods to test the performance of these products: tests taken from NetBench, the ZD Labs network benchmark test suite, and a timed file transfer using Microsoft Excel. We evaluated these products as end-user remote-client server solutions and, with the Microtest Lanmodem and the Shiva NetModem/E, as routers between two separate networks. DCA Remote LAN Node (RLN) does not support routing, so we did not subject it to our Remote Routing test. We consulted the vendors and set up the required software and hardware to their specifications.

We ran NetBench from a remote PC connected by modem to a private branch exchange (PBX) system simulated by the Panasonic Electronic Modular Switching System, Model 616 EASA-Phone. We also connected the communications server device to the PBX simulator and in turn attached the device to the network file server through an Ethernet interface supplied by the vendor.

The NetModem/E and Lanmodem each have a 14.4-Kilobit-per-second network modem built into a single box that also contains an Ethernet interface and the firmware needed to redirect communications between the network cable and the phone line. RLN requires a dedicated communications server PC on which you must install the software and the bundled Standard Microsystems Corp. Ethernet adapter and attach your own external modem. We used an Intel 14.4EX modem at the server side when testing RLN and another Intel 14.4EX at the remote side when testing all the products. The NetModem/E, Lanmodem, and Intel 14.4EX all provide V.32bis modulation and V.42bis data compression.

All of the PCs we used were Compaq Deskpro 386/25e's. The remote PC had DOS 5.0, Microsoft Windows, and Microsoft Excel installed, while the server PC had NetWare 3.11 installed and used IPX (Internet Packet Exchange) as its transport protocol. For the Remote Routing test, we set up another LAN and connected the product to each server.

The **I/O Throughput** test measures the amount of data a remote-client server can transfer from the file server in one second. We ran NetBench from a remote PC to perform reads and writes to a 10K and a 50K file located on the server, using 1,024-byte packets. The 3-to-1 ratio of reads to writes simulates a typical user environment. We report the results in kilobits per second.

The **Large IPX Packet** test measures the impact of NetWare's BIGPACK.NLM (NetWare Loadable Module) on remote-client server performance. The test follows much the same procedure as the I/O Throughput test, except that we used only 10K files and loaded BIGPACK.NLM on the server to enable larger packet transmissions. We did not use the 50K files because we specifically wanted to see whether the products could take advantage of the NLM; the 10K file test gives a sufficient indication of this ability. We report the results in kilobits per second.

The **Remote Routing** test measures the speed at which the product allows a network user to transfer data between file servers on two networks. We set up two LANs, with the tested product connected to both server A and server B. NetBench runs from a remote PC attached to server A. Using the routing software supplied by the vendor, the remote PC attaches to server B and runs NetBench across the router between both servers. We report the throughput results in kilobits per second.

The **Windows File Retrieval** test measures how long it takes to move a large file across a remote link to the dialing-in node. The test accesses a 60,474-byte spreadsheet stored on a file server on the remote LAN. The remote PC uses the tested product to log on to the network, launches Microsoft Windows and Microsoft Excel locally, then retrieves the Excel spreadsheet from the server. The test runs three times; we use a stopwatch for measurement. We report the results of this test in seconds.

dial-out capabilities. If your chief objective is to connect disparate groups of mobile or remote users to a central LAN, stick with a pure dial-in solution. RLN supports many more simultaneous users than the NetModem/E or the Lanmodem, which will help keep traffic jams to a minimum. Furthermore, RLN provides hardware-based security and support—important features for enterprise-wide networks—for several network operating systems.

If you need dial-in and dial-out support, your choice will depend on other factors. The number of simultaneous users supported cannot be a major issue, since the NetModem/E supports only one user and the Lanmodem only two.

If your main needs are for administrative tools and security, the Lanmodem

*If you need to connect
disparate groups of mobile
or remote users to a central
LAN, a pure dial-in
solution is probably your
best choice.*

will look attractive; it tracks calls and generates log reports, and, for network protection, it writes directly to NetWare's Bindery database to check user names and passwords.

The Lanmodem does not, however, support AppleTalk; the NetModem/E does. Furthermore, the NetModem/E provides excellent Windows support, where the Lanmodem offers no native Windows support, and its overall performance is superior to the Lanmodem's.

GLOBAL COMPUTING: ARE WE THERE YET?

Is remote-client technology the first step to global networking? Probably, but it has a long way to go. Before they can go global, remote-clients must first go corporate. They must support more users, at least one management protocol, such as SNMP (Simple Network Management Protocol) or CMIP (Common Management Information Protocol), and more network protocols. As they evolve,

► SUMMARY OF FEATURES

Remote-Client Servers

This table compares the distinctive attributes of the remote-client servers we review.

They have some features in common:

- Each product comes with an Ethernet card and separate AUI, BNC, and RJ-45 connectors.
- Each will monitor phone lines and display the number of connected users and their names.
- Each provides dial-back and password protection and will disconnect callers after three log-on failures.

Products listed in alphabetical order

	DCA Remote LAN Node (RLN)	Microtest Lanmodem	Shiva NetModem/E
List price	\$795–\$6,850	\$1,995–\$2,595	\$1,699

Network Operating System Versions Supported

NetWare	2.15, 2.2, 3.11	2.15c, 2.2, 3.0, 3.01, 3.1, 3.11	2.15, 2.2, 3.01, 3.11
Microsoft LAN Manager	2.0, 2.1	None	None
VINES	4.10, 4.11	None	None
LANtastic	None	None	LANtastic for NetWare
AppleTalk	None	None	All versions

Requirements

RAM used on client	54K	31K	13K
RAM used on server	1MB (dedicated server required)	None	None
Hard disk space used on client	380K	460K	250K
Hard disk space used on server	750K	1.5MB	500K

Hardware Configuration

Modem	☐	☒	☒
Token-Ring card	☐	☒	☐
Maximum port speed	57,600 bps	57,600 bps	57,600 bps
Maximum number of incoming lines	16	2 per device	1 per device
Supports multiport boards	☒	☐	☐

Software Configuration

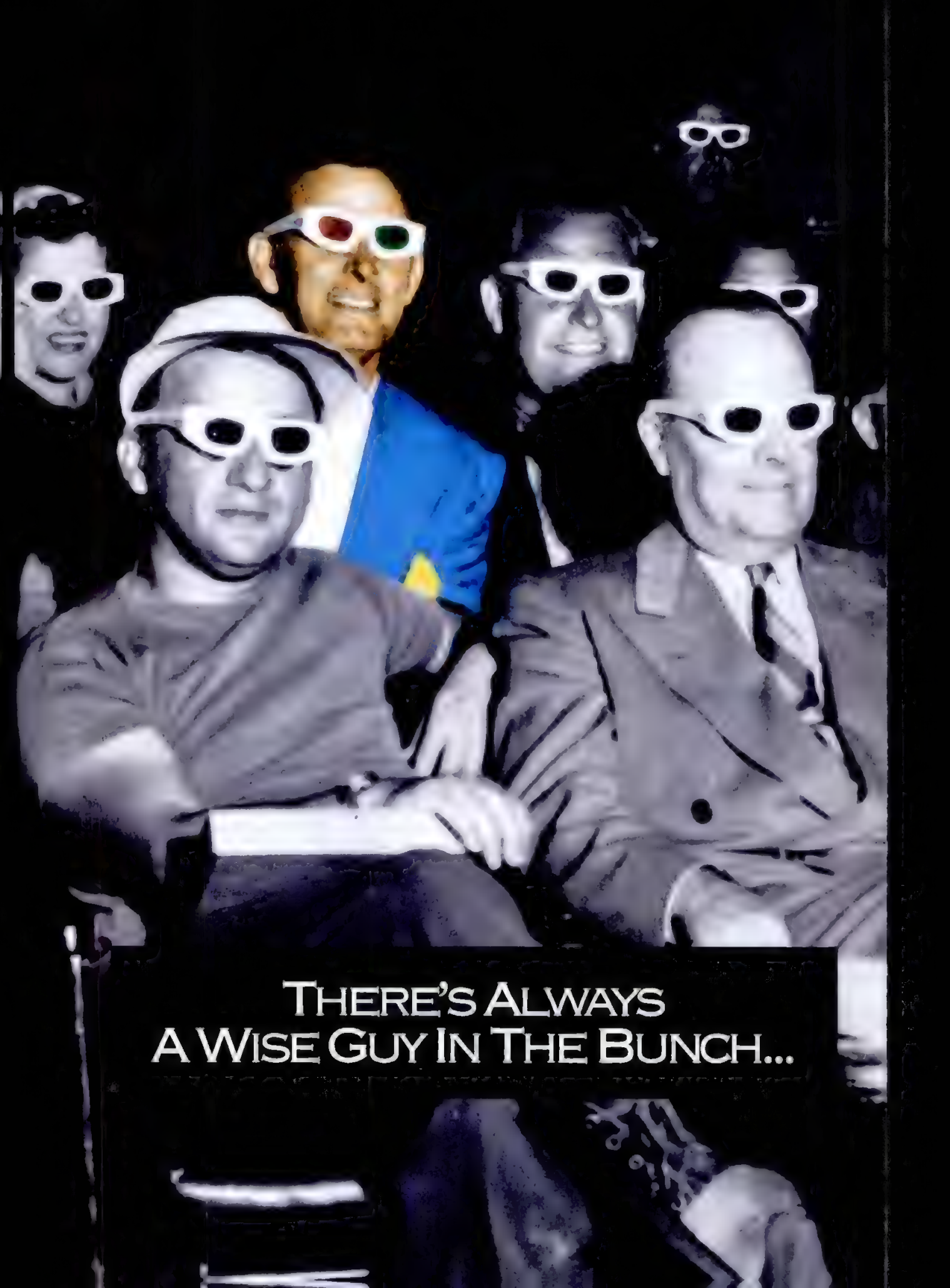
Remote dial-in software	☒	☒	☒
Maximum number of simultaneous users	16	2	1
Supports Microsoft Windows	☒	☐	☒
Includes Windows-specific software	☒ (device drivers only)	N/A	☒
Routing capability	☐	☒	☒

Management Capabilities

Identifies the number of packets sent and received	☒	☐	☒ (at remote client)
Displays available servers	☐	☒	☒
Displays available ports	☒	☒	☒
Lets administrator create groups of users	☐	☒	☒
Lets administrator restrict number of log-on attempts	☐	☐	☐
Lets administrator set log-on times	☐	☐	☐

N/A—Not applicable. The product does not have this type of feature.

CONTINUES



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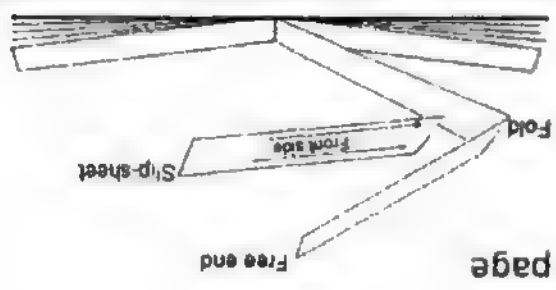


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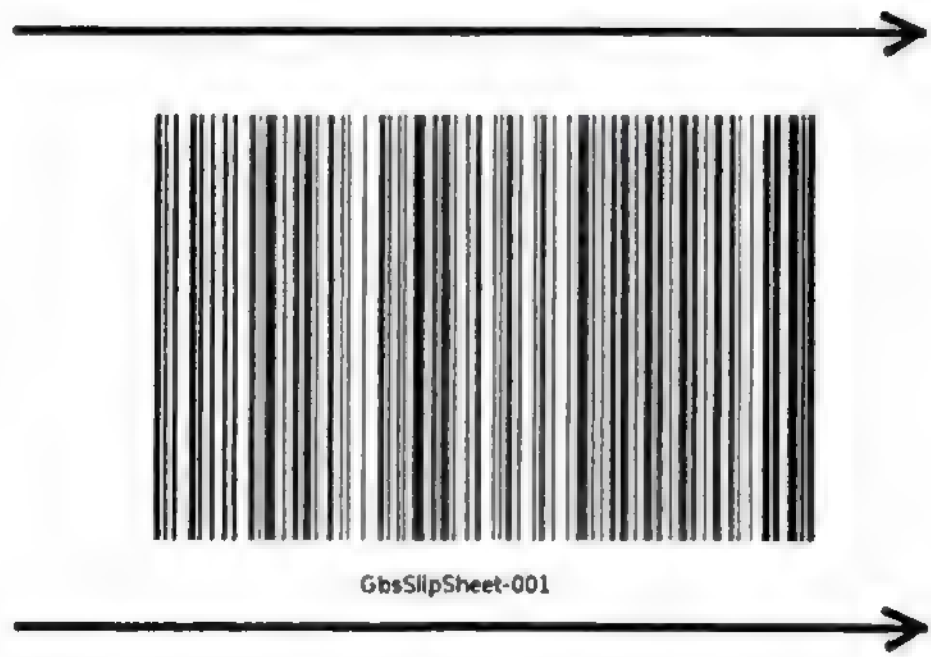


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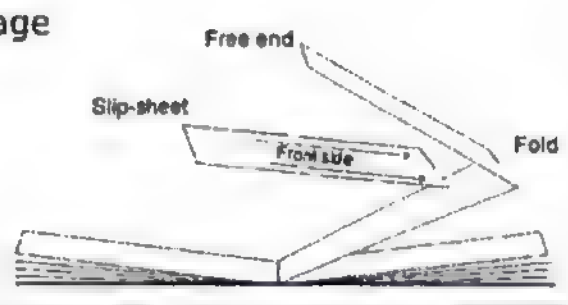
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 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet



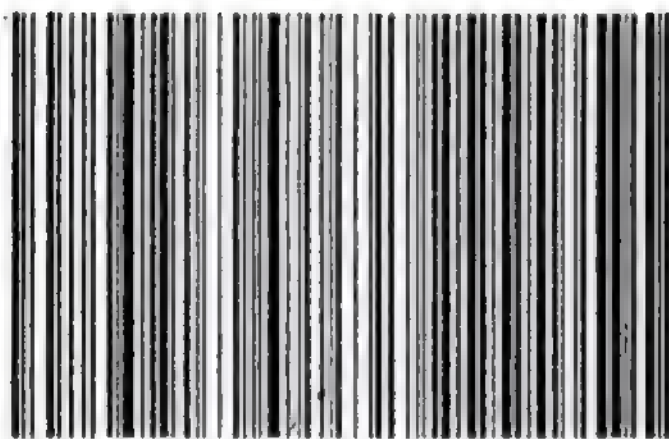
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 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lip8ack-0018

Back

1. Follow instructions on the other side



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486 66MHZ DX2 \$2295

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- ▶ System User Manual
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- ▶ Customizing Options Available

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486 50MHZ DX2 \$2495

486 33MHZ EISA \$2745

486 50MHZ DX2 EISA \$2895

486 66MHZ DX2 EISA \$3095

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- ▶ 3 Button 1600 DPI Mouse
- ▶ System User Manual
- ▶ 60 Day Money Back Guarantee
- ▶ On-Site Service
- ▶ Customizing Options Available

EISA Systems Standard w/32 Bit HDI Controller

LOCAL BUS SYSTEMS

- ▶ EPS 32 Bit S3 Local Bus GUI Accelerator Card w/ 1MB VRAM
- ▶ 14" EPS 1024NI Color SVGA Monitor
- ▶ 256K High Speed RAM Cache
- ▶ 4 Meg 70ns SIMM RAM
- ▶ TEAC 1.2MB & 1.44MB Drives
- ▶ Maxtor 130 Meg 15ms IDE Cache Drive (150,000 Hour MTBF)

- ▶ 101 Enhanced Keyboard
- ▶ Baby Desktop Case w/6 Drive Bays
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- ▶ System User Manual
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- ▶ On-Site Service
- ▶ Customizing Options Available

486 33MHZ \$1945

486 50MHZ DX2 \$2095

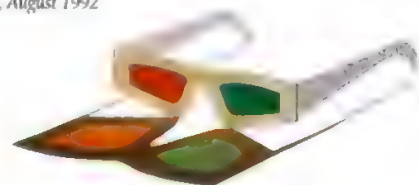
486 66MHZ DX2 \$2445

Wise guys love the fact that all EPS systems come fully loaded. "Among the 50 computers I've reviewed since the introduction of DOS 5.0, EPS's 486-50 was the only one to arrive with its CONFIG.SYS file correctly set up to use DOS's upper memory block. Apparently EPS's expertise

extends to both hardware and software."

PC Sources, August 1992

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they will begin to slip into the wiring hub, just as file servers are doing.

In the next several years, InfoCorp projects that the marketplace will begin to include communications servers with dial-in and dial-out capabilities reduced to a single chip. Much like the network-ready PCs that come with motherboards equipped with Ethernet and Token-Ring capabilities, new communications servers will be integrated onto the PC's motherboard. Already, modem vendors are working with OEMs of portable PCs to provide such modem chips.

Remote-client vendors are enhancing their product lines to respond to corporate needs. For example, Shiva's recently announced LanRover/E, an Ethernet remote-client server that comes in either 4- or 8-port dial-in-only versions that can be

*Cross Node from Cross
Communications will
feature beefed-up
administrative tools, all of
which can be customized by
the network administrator.*

monitored and configured remotely, is rack-mountable; it also supports SNMP management with IPX, and the Novell Management System or Shiva's own software. Shiva promises future versions will offer an 8-port dial-in only solution for Token-Ring; protocols such as NetBEUI and TCP/IP will also be supported.

Cross Communications has announced Cross Node, a hardware-independent software solution that supports up to 20 dial-in and 999 dial-out users, IPX and NetBIOS protocols, and Token-Ring and Ethernet in the same version. Cross Node will also feature beefed-up administrative tools, all of which can be customized by the network administrator. Cross Node is designed to work with Cross+Connect, the company's remote-control package, and should be shipping by the time you read this.

One remote-client server (introduced too late for our review) has already moved into the wiring hub—Centrum

► SUMMARY OF FEATURES

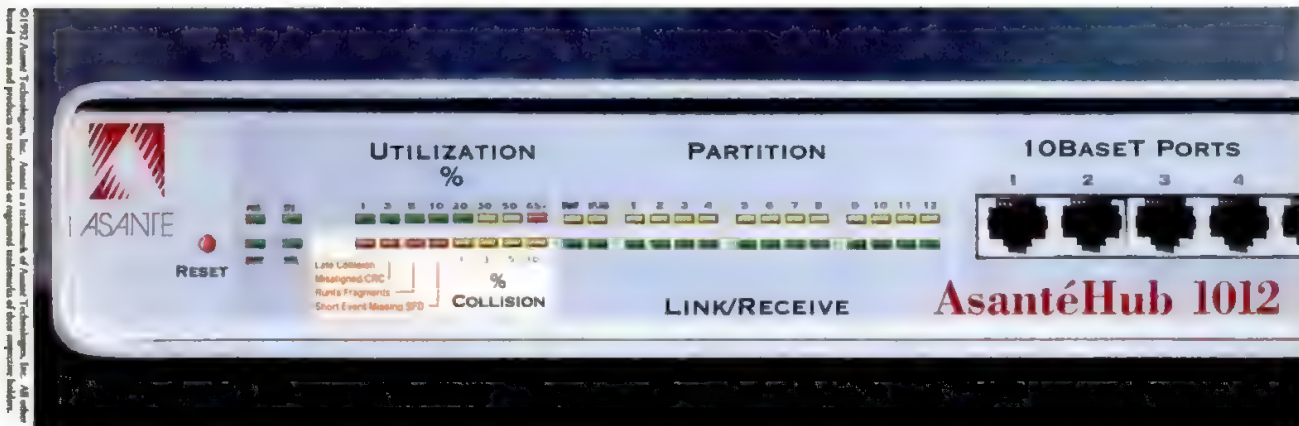
Products listed in alphabetical order

■ = YES □ = NO

	DCA Remote LAN Node (RLN)	Microtest Lanmodem	Shiva NetModem/E
Management Capabilities (continued)			
Can keep log of connections made	■	■	□
Tracks lost connections	■	■	□
Can create weekly report log	□	■	□
Displays logs on-screen	■	■	N/A
Can output logs to file	■	■	N/A
Distinctive security measures	Ethernet addresses	NetWare Bindery	NetWare Bindery
Protocols			
Uses PPP	■	□	■
Uses SLIP	□	■	□
Includes data compression	■	■	■
Header compression	□	□	■
Tinygram compression	■	□	□
Driver Support			
NDIS	■	□	□
Open Data-link Interface (ODI)	■	■	■
PDS	■	□	□
Internal Board Features			
Uses surface-mount technology	■	■	■
Uses switches	□	■	□
Uses jumpers	■	□	□
Type of RAM used	SRAM	DRAM	SRAM
Type of ROM used	27512	Flash ROM	EPROM
Processor type	SMC 83C690 (controller)	None	Motorola 68000
Ethernet Support			
8-bit adapter	■	□	■
16-bit adapter	■	■	□
Includes serial-port connector	■ (8- and 16-user versions)	■	□
Communications Support			
Supports 16550A UART	■	■	■
Supports Hayes ESP board's extra buffers	Info not available	□	□
Modem Features			
Supports V.32 signaling	N/A	■	■
Supports V.32bis signaling	N/A	■	■
Supports V.42 error control	N/A	■	■
Supports V.42bis compression	N/A	■	■
Support MNP 5 compression	N/A	■	■
Status lights	N/A	Error control, network activity, standard modem lights	Auto-answer, Ethernet traffic, serial port in use

N/A—Not applicable. The product does not have this type of feature.

CONTINUES



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punch-down block connections.

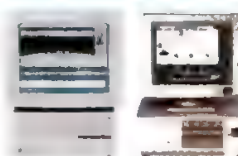
There is also a 3-in-1 "13th" port for interconnecting multiple hubs with backbone cabling. This port includes BNC, RJ-45 and AUI connectors supporting a variety of cabling media.

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Resellers: Asanté products are available from Ingram Micro, Merisel, and Tech Data.



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[3-in-1 auto-switching redundant backbone port with software override capability.]



[Remote out-of-band management lets you manage your network from anywhere in the world.]



Remote Access Server from Centrum Communications. Centrum Remote Access Server, a dial-in/dial-out solution, slides right into the hub, making it as integral to the network as the file server. Centrum's server supports up to 16 ports, and it can handle multiprotocol traffic, as well as a dial-up router to communicate with other networks. More remote-client products are coming. Network Products Corp. also plans to release a dial-in/dial-out remote-client server by the end of 1992.

IN THE MEANTIME

Right now, these products provide the cheapest, most efficient remote connection to the LAN today. The following reviews should help you decide whether a remote-client server is the right solution for your business—at home, on the road, or at headquarters.

Digital Communications Associates Inc.

DCA Remote LAN Node (RLN)

BY MICHAEL COHN

With multiple-user configurations, hardware- and software-based security, and widespread network operating system support, DCA Remote LAN Node (RLN) is ideal for connecting many remote callers to corporatewide Ethernet networks. Originally developed by Intercomputer Communications Corp. and now sold by Digital Communications Associates (DCA), Version 1.0 of DCA RLN provides an inexpensive and efficient dial-in-only solution.

Unlike the Shiva NetModem/E and the Microtest Lanmodem, RLN can support up to 16 simultaneous users. It exhibited better performance than the Lanmodem or NetModem/E in most of our dial-in tests, and is priced reasonably,

► SUMMARY OF FEATURES

Products listed in alphabetical order

■ = YES □ = NO

	DCA Remote LAN Node (RLN)	Microtest Lanmodem	Shiva NetModem/E
Modem Features (continued)			
Supports hardware flow control	N/A	■	□
Supports software flow control	N/A	■	■
Power on/off switch	N/A	□	■
Hardware volume control	N/A	□	□
Most similar command set	N/A	Hayes	Hayes
Outbound Capabilities			
Functions as dial-out modem server	□	■	■
Maximum number of outgoing lines	N/A	2 per device (with optional external modem)	1 per device
Hardware redirection	N/A	■	■
Software redirection	N/A	■	■
Supports interrupt 14h	N/A	■	■
Supports Novell's NASI standard	N/A	■	■

N/A—Not applicable. The product does not have this type of feature

ENDS

with 2-, 8-, and 16-user versions costing \$795, \$3,795, and \$6,850, respectively.

RLN lacks some important features, however. The price doesn't include the modem or dedicated server PC you'll need. And unlike the NetModem/E and Lanmodem, RLN does not give network users dial-out capability. It also lacks the ability to check the Novell Bindery to verify remote-user authorization; you have to set up individual user profiles instead. Finally, RLN doesn't provide remote-routing features to let network users connect to other networks via a dial-up line.

The program relies on the Point-to-Point Protocol (PPP) to communicate between two nodes. It acts as a MAC- (Media Access Control) layer bridge from Ethernet to network transport protocols such as NetBIOS (LAN Manager), IPX/SPX (NetWare), VINES IP (VINES), and Transmission Control Protocol/Internet Protocol (TCP/IP).

RLN offers a proprietary data-compression protocol, also called RLN, in addition to PPP's Tinygram compression. The RLN protocol's run-length encoding and protocol-header compression work alongside a modem's own V.42bis compression, helping the package beat the

NetModem/E and Lanmodem in transferring 10K and 50K files on our I/O Throughput test, and in retrieving a Microsoft Excel file. Shiva's support for NetWare's BIGPACK.NLM makes the

► FACT FILE

DCA Remote LAN Node (RLN), Version 1.0

*Digital Communications Associates Inc.,
1000 Alderman Dr., Alpharetta, GA 30202-4199; 800-274-6633, 404-442-4000;
fax, 404-442-4366.*



List price: Two users, \$795; eight users, \$3,795; 16 users, \$6,850.

Requires: 1MB RAM; 386SX dedicated server (33-MHz 386 recommended for 8- and 16-user versions); modem (or null-modem cable for direct connections); network supporting NDIS, ODI, or

PDS; DOS 3.30 or later.

In short: DCA Remote LAN Node (RLN) is a dial-in-only solution with good performance, useful troubleshooting capabilities, a parallel-port security feature, and compatibility with a wide variety of networks.

 475 ON READER SERVICE CARD

SUITABILITY TO TASK				
DCA Remote LAN Node				
	POOR	FAIR	GOOD	EXCELLENT
Transparent network access	●	●	●	●
Windows compatibility	●	●	●	○
Security	●	●	●	○
Manageability	●	●	○	○
Reliability	●	●	●	○

NetModem/E more efficient than the other products at handling large packets. RLN did outperform the Microtest Lanmodem on the Large IPX Packet test, however.

The key to RLN's flexibility is its support for three widely accepted driver specifications: the Network Driver Interface Specification (NDIS), Open Data-link Interface (ODI), and Packet Driver Specification (PDS). Since AppleTalk and LANtastic currently don't conform to these specs, they do not work with RLN. The NetModem/E works with NetWare and AppleTalk; the Lanmodem works only with NetWare.

You can easily set three security options for each user: password, dial-back,

RLN provides stronger network management than the NetModem/E. If a problem occurs, you can view the status of each line from the server.

and network ID. Network ID security requires connecting an attachment to the parallel port containing a hardware-encoded Ethernet address. The program automatically disconnects users after three failed log-on attempts.

The RLN two-user package consists of software, security devices for the server's and clients' parallel ports, and a 16-bit Ethernet card (Standard Microsystems Corp.'s Ethercard PLUS Elite16 Combo, the equivalent of the old reliable Western Digital 8013 adapter). The 8- and 16-user versions come with multiport serial adapters. DCA provided Intel 14.4EX modems for our tests but does not sell them.

RLN provides stronger network management than the NetModem/E. In case a problem occurs, you can view each line's status from the server, including users connected, number of packets sent and received, and various error types. The program automatically stores this information in a log file.

RLN's directory listings seemed slow,

■ Async Dial-in from Network Vendors

by Michael Cohn

Single-sourcing has its advantages. Many asynchronous dial-in products from third-party vendors can work over a variety of network operating systems, but buying a solution from your LAN vendor gives you the vendor's own special enhancements, a similar interface for administrative utilities, and, best of all, a single company to blame if something goes wrong.

Novell offers three asynchronous dial-in products: NetWare Remote Shell, NetWare Access Server, and NetWare Asynchronous Communication Services (NACS). NetWare Remote Shell is a remote client that works with the NetWare Asynchronous Remote Router to provide transparent access to the LAN. Both come free with NetWare 2.2 and recent shipments of 3.11. Novell recommends, however, that you download improved versions of these dial-in programs from its online service NetWare (located on CompuServe), where they are stored under the filename PTF299.ZIP in library 9 of NOVLIB.

You install the shell on your remote machine and the router on a dedicated external router on your network. The programs send NetWare IPX/SPX (Internet Packet Exchange/Sequenced Packet Exchange) packets across the asynchronous link; the overhead of transmitting packets is high, though, so these programs are best used when you run your applications locally.

NetWare Access Server sends only screen changes and keystrokes over the link, so it operates more efficiently. But Access Server, version 1.2, also comes with a hefty price tag (\$2,395). This remote-control server gives as many as 16 users of PCs or Macintoshes remote access to a NetWare network. The client-side program, OnLAN/PC, lets PC us-

ers multitask DOS programs through a menu interface similar to NetWare's. Or they can run a general-purpose communications program to transfer files.

NetWare Access Server also features chat windows, audit logs, and X.25 support for public data networks. Security features include dial-back capability and tight integration with the NetWare Bindery database of user rights.

NetWare Access Server works with Novell's dial-out product, NACS. Version 3.0 of NACS costs \$595 for a 2-port version, \$1,795 for 8 ports, and \$4,995 for 32 ports. NACS has some dial-in features of its own. You can use a third-party remote-control program, such as Norton pcAnywhere, to route incoming calls from a NACS modem to a network-connected PC running the same remote-control program. But NACS does not have NetWare Access Server's multiuser, multitasking, and administrative features.

LAN MANAGER

Users of Microsoft LAN Manager shouldn't feel left out of the picture. Microsoft LAN Manager Remote Access Service supports up to 16 users on a server, the same number as with NetWare Access Server, for a cost of \$1,995 per server. The product has a long list of administrative and security features. In addition to call-back, Remote Access Service encrypts the password authentication procedure and lets you create domains of multiple servers, enable remote-access permissions, disconnect unauthorized users without interrupting service to other users, and hide servers from remote users. Although you don't get the parallel-port security of DCA Remote LAN Node, Remote Access Service provides an effective set of security features. The

product also has a phone-book feature that enables you to list different servers for easy dial-up.

Microsoft doesn't target its dial-in service at users who want to run programs from the server, however. In the product's manual, Microsoft recommends that users run applications locally and use Remote Access Service to get data files from the server. Although the service can run programs remotely and give users transparent access to certain applications, mainly those written to support LAN Manager client/server features, the manual notes that most applications will be "unacceptably slow." And while Remote Access Service can work with programmable modem-pooling equipment, Microsoft's program does not have dial-out features of its own.

VINES

Like Novell, Banyan gives its users a choice. Its PC Dial-In option costs \$1,495 and gives up to 32 users transparent remote access to VINES network services, including files, host connections, e-mail programs, and applications stored on the network. As with the remote-node solutions, you get much better performance by running your applications on your local machine. A proprietary compression algorithm cuts down on the overhead of phone-line communications and works with the VINES IP protocol over the line. PC Dial-In supports from 6 to 30 dial-in lines, depending on the version of VINES you're running and the number of Banyan 6-port cards installed in your server. You use the integrated VINES security service to manage user rights.

Banyan's other dial-in choice, the VINES X.29 Option, includes VINES X.29 Inbound and VINES X.29 Outbound components and costs \$995. It enables as many as 15 users to access VINES network services through X.25 public and private data networks as well as through ISDN (Integrated Service Digital Network) connections.

The dial-in products from Banyan, Microsoft, and Novell each provide one benefit that the products in our main

reviews can't match: full integration with the network operating system itself. And that advantage is hard to dismiss when you need to administer a complex network.

NetWare Access Server, Version 1.2
NetWare Asynchronous Communications Services (NACS), Version 3.0
Novell Inc., 122 East 1700 South, Provo, UT 84606; 800-638-9273, 801-429-7000

List price: NetWare Access Server, \$2,395. NACS, 2 ports, \$595; 8 ports, \$1,795; 32 ports, \$4,995.

Requires: NetWare Access Server: for server: 386-based PC or better, 4MB of RAM, LAN adapter, modem, DOS 3.0 or later, NetWare 2.1 or later; for client: 512K of RAM. NACS: 386 PC or better as server, NetWare 3.11.

Circle 483 on reader service card

Microsoft LAN Manager Remote Access Service, Version 1.0

Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080

List price: \$1,995 per server.

Requires: For server: 281K of RAM for one connection, 101K for each additional connection, LAN adapter with NDIS driver, modem, OS/2 1.21 or 1.3, Microsoft LAN Manager 2.1 or later. For client: 640K on LAN Manager Enhanced stations, 512K on LAN Manager Basic stations, 3MB on OS/2 stations, modem, DOS 3.3 or later or OS/2 1.21 or 1.3.

Circle 484 on reader service card

PC Dial-In

VINES X.29 Option

Banyan Systems Inc., 120 Flanders Rd., Westboro, MA 01581; 800-828-2404, 508-898-1000

List price: PC Dial-In, \$1,495; VINES X.29 Option (includes VINES X.29 Outbound and VINES X.29 Inbound), \$995.

Requires: PC Dial-In: modem, Banyan ICA (Intelligent Communications Adapter) port, DOS 2.10 or later, VINES 4.0 or later; VINES X.29 Option: modem, Banyan ICA port, VINES X.25 Server-to-Server, VINES Asynchronous Terminal Emulation, VINES 4.11 or later.

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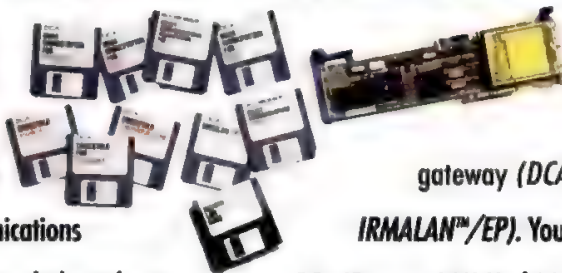
IMAGINE THERE WERE PEOPLE COUNTING COME TO THINK

Okay, so the barrier between micros and mainframes is hardly a Berlin Wall. Still, you have to admit, it hasn't exactly helped the free flow of information. For that matter, neither have the walls between Windows,[™] DOS, Mac[™] and OS/2.[®] Between LANs and hosts...different LAN topologies...whatever.

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If you specify DCA — you won't be beating your head against the usual wall of lackluster service and support. That's because we've

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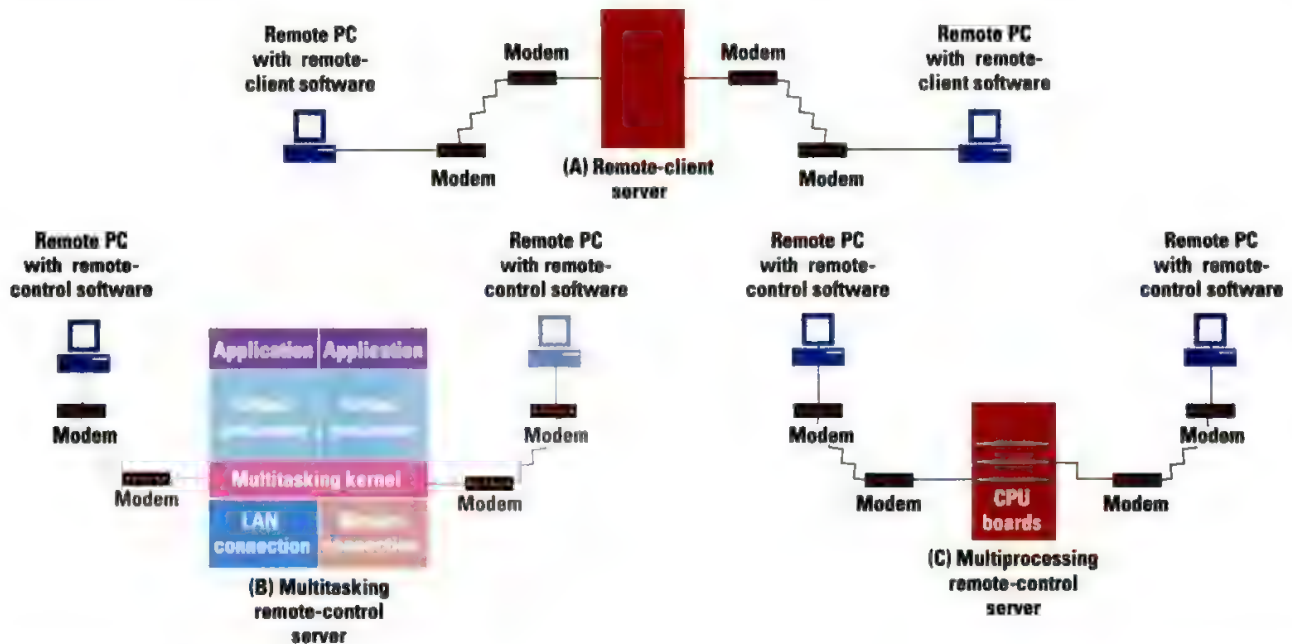
DCA



■ Dialing into the LAN

There are three types of asynchronous communications servers. Remote-client servers (A) process all the data on remote PCs. In contrast, remote-control servers process all the data on the communications

server. Multitasking remote-control servers (B) use a multitasking operating system to service their clients. Multiprocessing remote-control servers (C) use multiple CPU boards. Each user can control one CPU.



however, and log-ons took nearly 8 seconds. When we temporarily interrupted the line, RLN could not automatically reconnect and we had to redial. You also cannot configure the number of log-on attempts, set log-on hours, generate weekly reports, or print the log file from within the program.

RLN provides readable and well-organized documentation, but you need to consult a separate manual midway through setup before you can install the network drivers. Free technical support is available toll-free and by fax.

DCA needs to add dial-out, routing, and more extensive administrative features. Version 1.1, released after testing, includes a TTY (teletype) interface that allows RLN users to navigate various front ends, and DCA's own intelligent, multiport adapter cards (formerly, RLN used DigiBoard's adapters). Even in its initial version, RLN provides handy troubleshooting and security options, good file-transfer performance, and cost-effective multiport configurations for networks with heavy dial-in traffic.

Microtest Inc.

Microtest Lanmodem

BY JONATHAN MATZKIN

The Microtest Lanmodem does it all: dial-in, dial-out, call-tracking, and remote routing, allowing NetWare users to access more than one network's resources. Priced at \$1.995 for the Ethernet version and \$2.595 for Token-Ring, Microtest's network modem handles its job effectively and efficiently.

Like the Shiva NetModem/E, the Lanmodem is a router. It distinguishes itself from the NetModem/E by offering a LAN connector and more extensive logging and reporting. The slightly bulkier, 2- by 9- by 8.5-inch (HWD) Lanmodem allows simultaneous dial-in and dial-out with any additional modem you choose. File-transfer performance lagged behind the NetModem/E and DCA Remote LAN Node, however, and we discovered a minor bug in dial-out support. The Lanmodem works only with NetWare.

In addition to the Lanmodem, Microtest's networking products include the Lanport II, a modem-sharing device with dial-in features, and network diagnostic equipment.

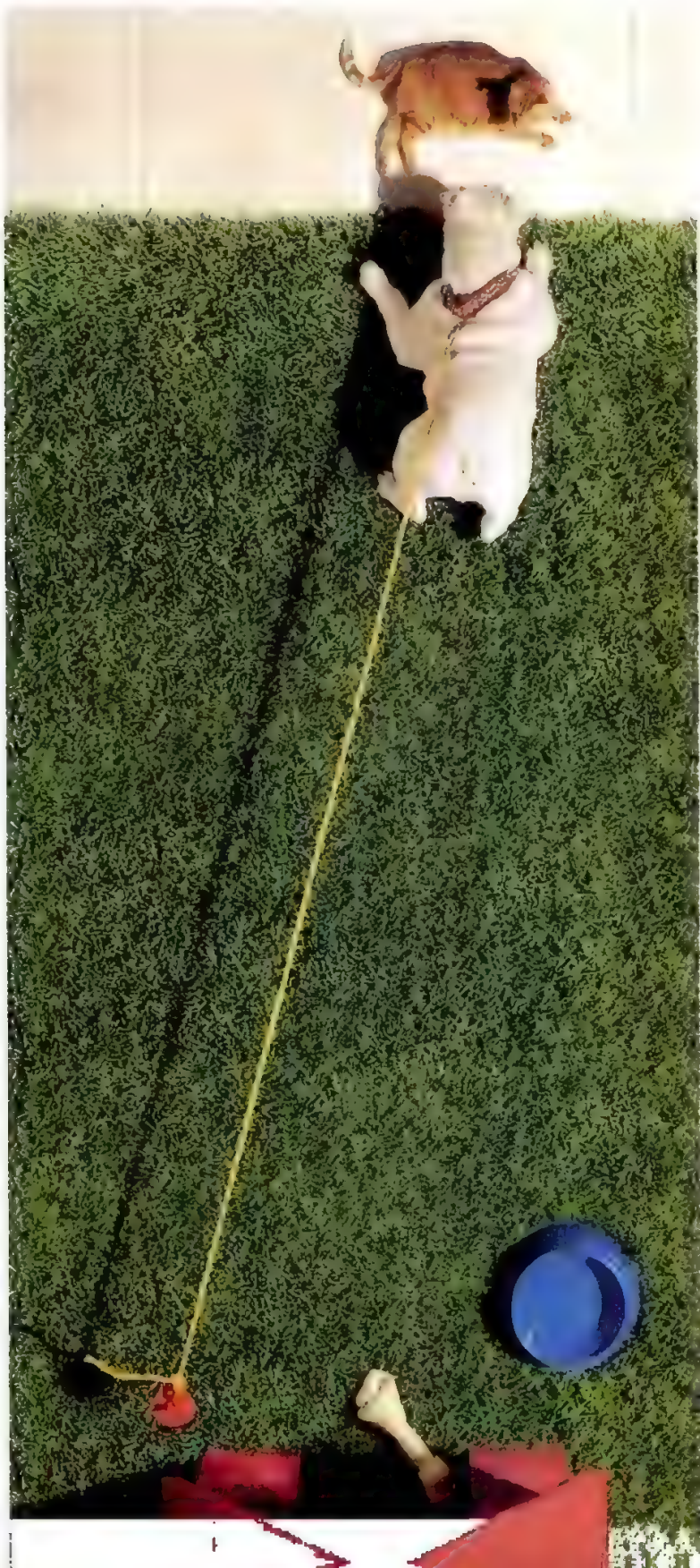
On the rear panel of the Lanmodem, you'll find a connector for factory diagnostics, an RS-232 serial connector, and connectors for thin, thick, and twisted-pair Ethernet cabling. The Token-Ring version provides one DB-9 connector.

The Lanmodem's case shelters a V.32bis modem with V.42bis data compression, a network adapter, 512K of RAM, and 128K of flash ROM for down-

SUITABILITY TO TASK

Microtest Lanmodem

	POOR	FAIR	GOOD	EXCELLENT
Transparent network access	●	●	●	○
Windows compatibility	●	●	●	○
Security	●	●	●	○
Manageability	●	●	●	○
Reliability	●	●	●	○



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loading configuration details during initial setup or software upgrades. The software component runs under DOS only, but Microtest is working on a Windows version that should be shipping by the time you read this.

Dial-in and other operations are simple and transparent. Microtest makes dialing out easy by including the modem-pooling option in the basic setup process. Internetworking also works smoothly,

***The Microtest Lanmodem
simplifies dial-out by
including the modem-
pooling option in the basic
setup process.***

providing permanent or temporary routing connections.

Logging on is straightforward, but as with the other products we review, you need to run applications locally for efficient performance. While the NetModem/E uses a separate utility to trap attempts to run executables over the phone line, Microtest's software integrates this option directly. The software also lets you download the executable file instead

■ Configuring for Remote Operation

by Frank J. Derfler, Jr.

Your success with remote-client server systems depends on how well you configure your remote computer for communications sessions. The basic rules are: Send as little as possible across the telephone line and never pull a .COM, .EXE, or .INI file from the network.

Under NetWare, utilities such as CAPTURE, FILER, LOGIN, MAP, SYSCON, USERLIST, WHOAMI, and other programs the caller might use should be loaded on the remote computer.

Creating a different log-on script for each remote client will help ensure that the session is simple and efficient. The log-on script should have several components. You can save time by setting MAP DISPLAY OFF, so the disk drive mapping won't display during log-on. Since all files will probably be stored on the local drive, change the search drives to eliminate searches to PUBLIC and other network subdirectories. And modify the CAPTURE command so that print jobs are directed to the printer you wish to use, whether it be the printer that's attached to the network or a printer at the remote end.

You could set the proper configuration by giving individual users different log-on IDs for local and remote operation. This approach will double your administrative load, however. Let NetWare do the work for you instead: The easy way to tell if someone is calling locally or remotely under NetWare is by using the NetWare

P_Station identifier. This network facility tells you if the address of the LAN adapter that is handling the call matches that of an adapter on the local network, or if it is the adapter address of an access server, which indicates a remote call.

You can use the following lines of code in a personal log-on script to detect when someone is calling in through a remote-node access server and to set the most efficient mapping. You could save time and instead put these lines in the system log-on script if all callers have their \DOS,

\NETWARE, and \WINDOWS subdirectories set up in exactly the same way. The following log-on script should cover all the important bases:

```
IF P_STATION = "ABCD12345678" THEN
  MAP DISPLAY OFF
  MAP INSERT S1: = C:\DOS
  MAP INSERT S2: = C:\NETWARE
  MAP INSERT S3: = C:\WINDOWS
  CAPTURE /Local=2 /queue=
  queue name
  WRITE "SEARCH DRIVES SET FOR REMOTE
  NETWORK ACCESS"
END
```

This NetWare log-on script tests for the LAN adapter ID on an access server. If it finds that address, it ensures that programs are called from local subdirectories and sets the networked printer to the LPT2: port. If-then sequences can test for other adapter IDs and generate the appropriate combination of search drives and printer redirection. □

of running it remotely.

Along with transparent access, the Lanmodem offers solid security. The software provides callback verification and checks the NetWare Bindery for names and passwords.

The Lanmodem's construction is also solid; it uses surface-mount technology for some components. The product's management features are more extensive than the NetModem/E's. You can save each user's call-in activity in a printable

ASCII file that lists interrupted and reconnected calls.

We found a few drawbacks during testing, however. Dial-outs through Crosstalk Mark 4 via NASI worked fine, but not via interrupt 14h. Microtest is working on a fix and reports successful interrupt 14h operation with the network version of Dynacomm Asynchronous for Windows, Procomm Plus, and several other packages. When we temporarily disconnected the phone line in another

► FACT FILE

Microtest Lanmodem

Microtest Inc., 3519 Shea Blvd., Phoenix,
AZ 85028; 800-526-9675, 602-971-6464;
fax, 602-971-6963.



List price: \$1,995, Ethernet version; \$2,595, Token-Ring version.
Requires: 33K RAM; 1.5MB hard disk space on network server; Novell (IPX), Ethernet, or Token-Ring cabling; communications package for dial-out purposes; analog telephone jack; NetWare 2.15c or later.

In short: The Microtest Lanmodem efficiently handles dial-in, dial-out, and routing connections. It offers a variety of built-in cabling connectors and supports an additional external modem to allow for two simultaneous communications sessions.

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NETWORKING

Async Dial-In

test, the Lanmodem sometimes reconnected automatically, sometimes not. Microtest claims our phone simulator caused the problem, but reconfiguring the simulator did not make a difference. The Lanmodem also lacks DCA Remote LAN Node's parallel-port security, and you cannot set times for log-ons.

Future releases should provide Windows compatibility and solve the Crosstalk interrupt 14h problems. Despite comparatively slow file-transfer performance, the Lanmodem's ability to control two communications sessions simultaneously improves efficiency on networks with heavy dial-in/dial-out needs.

Shiva Corp.

Shiva NetModem/E

BY JONATHAN MATZKIN

The Shiva NetModem/E handles dial-in, dial-out, and remote routing quickly, easily, and efficiently. For \$1,699, Shiva Corp.'s network modem gives NetWare and AppleTalk users transparent connec-

tions with Ethernet networks.

The only product that ships with DOS, Windows, and Macintosh software, the

FACT FILE

Shiva NetModem/E

Shiva Corp., One Cambridge Center,
Cambridge, MA 02142; 617-252-6300;
fax, 617-252-4852.



List price: \$1,699.

Requires: 2.25MB hard disk space (approximately) for DOS software, 3MB for Windows software; Novell (IPX) or AppleTalk network; Ethernet network cable; communications package to support dial-out from network; analog telephone line jack.

In short: The NetModem/E provides solid functionality for remote dial-in, remote routing, and dial-out from the network. Its support for Windows is a plus, but inadequate reporting and call-tracking capabilities are drawbacks.

 ON READER SERVICE CARD

NetModem/E showed the fastest performance on our Large IPX Packet test, and consistently outperformed the Microtest Lanmodem on our I/O Throughput and Remote Routing tests. More compact than the Lanmodem, the NetModem/E's main deficiencies are in dial-in management and call logging. Its documentation is also somewhat arbitrarily organized, and, unlike the Lanmodem and Digital Communications Associates' Remote LAN Node, the NetModem/E handles only one call at a time. This fall, Shiva plans to ship four- and eight-port dial-in solutions, the LanRover/4E and LanRover/8E, for less than \$2,000 and \$3,000, respectively.

The NetModem/E's V.32bis modem is a single-port, dual-protocol (IPX and AppleTalk) router that can connect to thick, thin, twisted-pair, or Appletalk Ethernet cabling, but you must specify the connector before you make your purchase. Well-designed with mostly surface-mount technology inside, each NetModem/E ships with server and remote software. Overall, the product has an air

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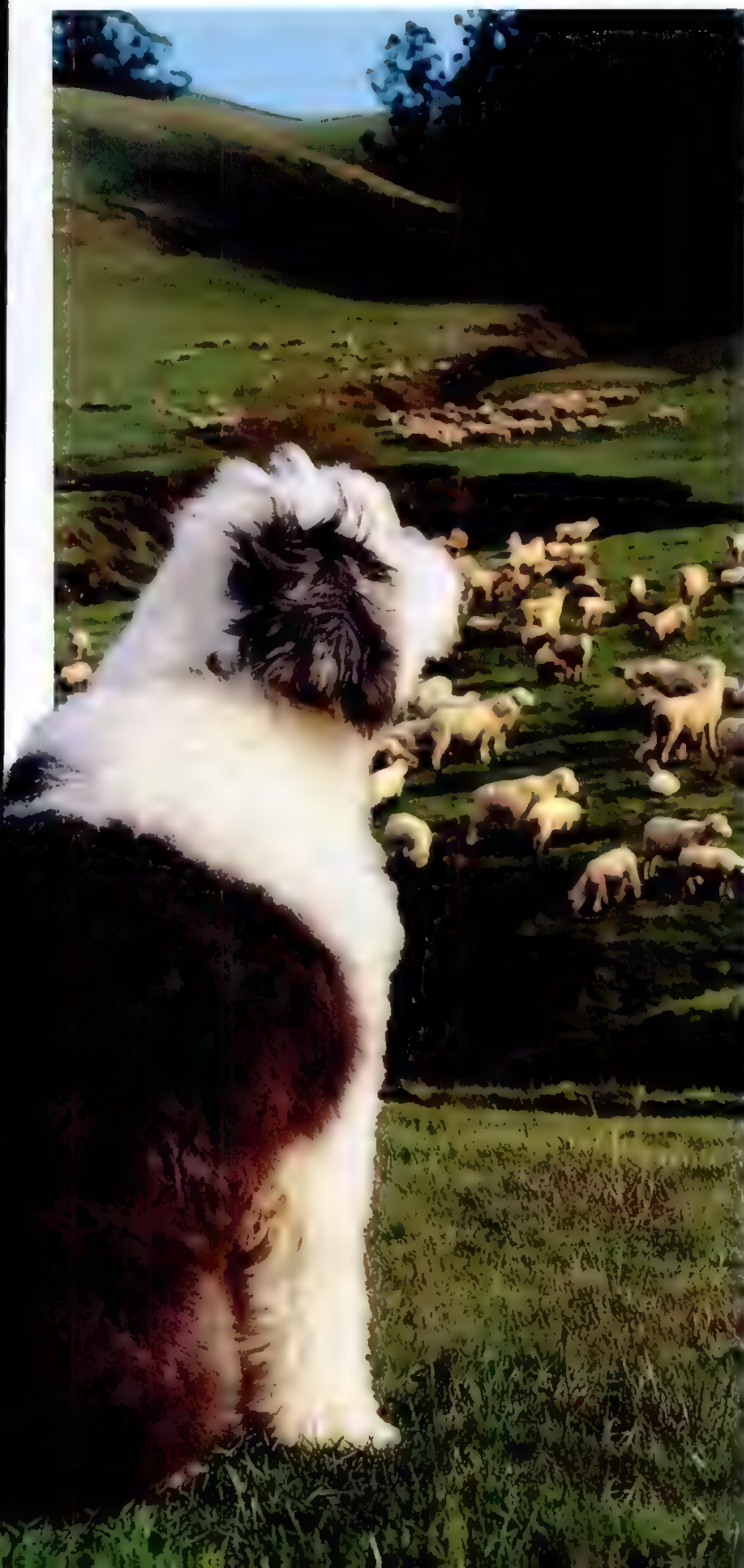
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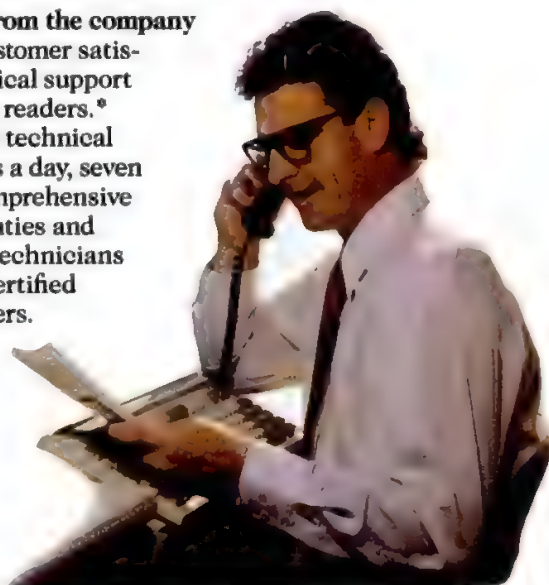
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The NetModem/E's transparent access resembles working from a local node. For dial-out, you can create a pool of NetModem/E devices for your four comm ports, and select one from the list. For temporary access to outside networks, remote routing is simple and straightforward. We noticed some delay when running a DIR command, but performance was more than adequate.

The NetModem/E retrieved a Microsoft Excel file about 10 seconds faster than the Lanmodem, but 3 seconds slower than DCA RLN. Its support for the Novell Large Internet Packet Exchange NLM helped it earn the top score on our Large IPX Packet test. Shiva builds V.42bis data compression into its modem and provides a configurable utility called Guard that alerts you

when you try to run executable files remotely, since this can slow performance.

In other tests, we successfully established dial-out connections using interrupt 14h and NASI through Crosstalk Mark 4 scripts. When we temporarily interrupted the phone connection after

issuing a DIR command, the NetModem/E not only automatically reconnected, it resumed the directory listing.

Dial-in security includes a call-back verification feature that works quite smoothly. You can

also create and download a table of user names and passwords to the NetModem/E. According to Shiva Corp., the next release of the product will add optional Netware Bindery support to allow automatic checking of user names and passwords. Standard NetWare network log-on procedures and security precautions

apply to remote log-ons as well.

There are problems with the NetModem/E, however. You cannot alter the default number of three failed log-on attempts before the NetModem/E disconnects you, specify user log-on times, create a status log of connections, or generate periodic reports. Shiva promises that the next version, due late this year, will provide extensive logging capabilities.

The documentation is clearly written and well-illustrated, but the user guide doesn't discuss hardware installation and the administrator guide doesn't thoroughly cover dial-out topics. Shiva provides support by phone, fax, America Online, CompuServe, AppleLink, the Internet, and its own bulletin board.

The inclusion of reporting, call-tracking, and Bindery support that Shiva promises in the next version of NetModem/E will greatly enhance an already solid product. The NetModem/E already offers DOS, Windows, and Macintosh users an easy-to-use, flexible communications solution for NetWare networks. □

SUITABILITY TO TASK				
Shiva NetModem/E				
	POOR	FAIR	GOOD	EXCELLENT
Transparent network access	●	●	●	○
Windows compatibility	●	●	●	●
Security	●	●	○	○
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CHOOSING & USING FONTS



Typecasting

Scalable type looks better than ever on the screen and on the page, and type has never been more widely available or easier to use than on today's PC. But the art and science of type—once understood only by specialists—still call for knowledge and skill if you want to produce pages that are not merely legible but attractive, and if you want to exploit the unprecedented variety of type technologies now available. Anyone who owns a copy of Microsoft Windows can print a legible page. With an understanding of digital type, you can print an eye-catching one.

We bring you up to date on today's font technologies and on the transformation of the type market brought about by the introduction of TrueType. Because TrueType is built into every copy of Windows 3.1, no other scalable font technology is as effortless to use or as universally available. And the arrival of TrueType in a market dominated by Adobe has

With the introduction of TrueType in Microsoft Windows 3.1, it's easier than ever to use fonts, but it's harder to select from among competing font formats. And how do you *use* all these fonts, anyway?

by Edward Mendelson

sparked a price revolution, making type on the PC more affordable than ever. These events have forever altered the landscape designed by Adobe, Bitstream, Hewlett-Packard, and others.

Here we describe the ways you use different formats, their technical strengths and conveniences, and the kinds of typefaces available in each. We also offer tips to streamline and speed up font usage—whether you're satisfied with one TrueType face or you work with numerous faces in multiple formats.

TYPE 1 VS. TRUETYPE

With the advent of TrueType in Windows 3.1, most users find that the most difficult step in working with scalable fonts is deciding which typeface to use. (A *font* is the collection of all characters in a typeface's character set for a given point size.) TrueType resembles other scalable font technologies—notably Adobe Systems' innovative Adobe Type Manager (ATM)—in that it allows you to view on virtually any screen the same fonts that you can print on virtually any printer.

But while TrueType incorporates major technical advances that improve clarity and legibility at small sizes and make font installation and management almost effortless, TrueType fonts are by no means the only sensible choice for everyone. The PostScript Type 1 fonts used by ATM and other programs have advantages of their own. Users of Type 1 fonts can choose among an unparalleled range

of typeface designs and an enormous number of special characters and symbols. You can use TrueType in Windows and on the Macintosh, but Type 1 is supported on every major platform. Major type foundries such as Adobe, Linotype-Hell, and Monotype have many more years of experience making high-quality

GETTING THE HINT

TrueType, developed by Apple and then improved jointly by Apple and Microsoft, is the most recent of many technologies based on scalable typeface outlines. A scalable outline consists of an ideal mathematical representation of a font; it isn't designed to be printed or displayed

directly. To print or display at any specific point size, a font rasterizer converts the outline into a bitmap font of the proper size, and displays or prints it.

Because 300 dot-per-inch laser printers and 96-dpi VGA monitors don't have enough pixels to reproduce all the subtle details of a typeface design, scalable fonts use instructions called *hints* to guarantee that small details don't get lost at low resolution. Hints also help to match a character's shape to the pixel grid of the screen or printer. Without these hints, the first stroke of the letter *n* would be one pixel wide if it happened to fall cleanly in a

column of pixels, while the second stroke might be two pixels wide because it happened to straddle two columns of pixels (see Figure 1).

Some of the most effective hints are those that apply differently at different point sizes, or, more precisely, at different numbers of *pixels per em*, the measure of how many dots are available for displaying or printing the largest character in a font. At small sizes, only a few pixels are available for displaying a character. If a rasterizer attempts to display a character's smallest features—a convex curve

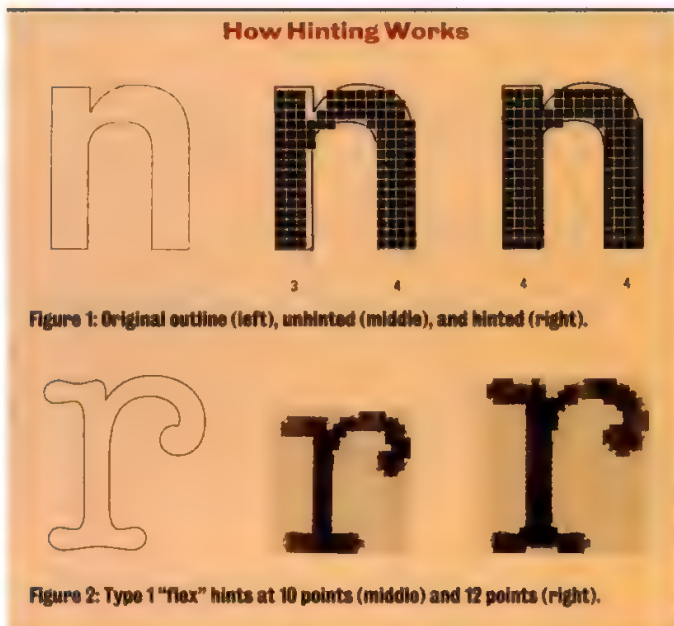


Figure 1: Original outline (left), unhinted (middle), and hinted (right).

Figure 2: Type 1 "flex" hints at 10 points (middle) and 12 points (right).

Type 1 fonts than any foundry has with TrueType.

TrueType offers the latest in technology and the greatest ease of use. But Type 1 will continue to offer the greatest artistic sophistication and variety: Large foundries privately admit that low TrueType font pricing has discouraged them from releasing the hundreds of designs they promised when the format was announced. For now, to take advantage of the typographic riches available on the PC, you should understand the strengths and weaknesses of both major formats.

Major Scalable Font Formats

Format	Published specification	Specification definer	First public use	Typefaces available (approximately)	Typical font file size	Number of characters supported by typeface outline file	Number of characters in typical printer font file
Intellifont	Yes	Agfa Division, Miles Inc.	1990	200	40K-85K	585	256
Speedo	No	Bitstream Inc.	1990	200	50K-80K	560	256
TrueType	Yes	Apple Computer Inc., Microsoft Corp.	1991	2,000	30K-80K	292	224
Type 1	Yes	Adobe Systems Inc.	1985	20,000	20K-60K	Unlimited	228

in a serif or a shallow curve in a vertical stroke, for example—those features will take up a disproportionate number of pixels and distort the design. Hinting can suppress those small features when there aren't enough pixels to display them accurately (see Figure 2).

On the other hand, small features such as accents must appear in their correct shape at all sizes. Hints can guarantee that an acute accent or circumflex won't be reduced to a solitary dot at small sizes and will retain at least the smallest number of pixels needed to display their shape.

Most Type 1 hints are *declarative*: They tell the rasterizer how much it can distort the shape of a character when generating output at small sizes. The rasterizer itself determines how to implement the hints. The potentially far more complex TrueType hints contain the code that implements the instructions. This means that TrueType hints aren't limited to simple declarations, but can affect output in ways that Type 1 rasterizers cannot. TrueType fonts, for example, can hint diagonals to reduce stair-step effects at small sizes.

The hinting in a font normally applies at all point sizes, but it becomes less significant at large sizes and especially with high-resolution output. In high-resolution image setters that work at 1,270 or 2,540 dpi, hinting is effectively irrelevant. When 600-dpi printing becomes commonplace on the desktop during the next few years, hints will matter much less than they do now. But on 300-dpi printers

and on all monitors in the foreseeable future, hinting will continue to have a crucial effect on clarity and legibility. The competition among font technologies is largely—but by no means entirely—competition among rival hinting methods.

The earliest hinted, scalable font technology widely available to end users was

longer needed a PostScript printer to use PostScript fonts. Similarly, LaserTools Corp.'s PrimeType for WordPerfect lets WordPerfect users print Type 1 fonts on any printer. You can buy almost 20,000 Type 1 typefaces, many of them with advanced typographic features such as true small capitals, which are shaped differ-

ently from normal capitals, and old-style numerals, which have ascenders and descenders similar to lowercase letters that make them more legible than the uniform-height numerals found in standard digital faces. Most graphic artists and designers use Type 1 fonts exclusively.

As with Type 1, most font formats are now independent of a PDL. TrueType was designed to be usable with any PDL, although Microsoft developed a superset of the PostScript PDL called TrueImage, which uses both Type 1 and TrueType as its native font formats. Microsoft now downplays TrueImage and few printer vendors support it. However, font formats remain built into the screen display of operating systems. Just as TrueType is built into Windows 3.1 and Apple's System 7, Type 1 is also built into operating systems: OS/2 PM uses ATM and the NeXT uses Display PostScript.

LOOKS ARE EVERYTHING

The spectacular output produced by the fonts that ship with Windows 3.1 made some users predict that all TrueType fonts would look better than their Type 1 counterparts: Reality proved different. The TrueType fonts in Windows have subtler details and livelier designs than Adobe's corresponding Type 1 fonts, but their superb appearance results from months of intensive optimization by Monotype. Few other TrueType fonts received nearly the same care, and many produce results that are no better than you get from comparable Type 1 designs.

Type 1 fonts and TrueType fonts differ radically in their internal formats, even when their printed output is identical. Both formats are programs written in programming languages: Type 1 is a subset of the high-level PostScript lan-

On Display: TrueType

PACK MY BOX PACK MY BOX
BROWN FOX JUM BROWN FOX JUM
AWAKEN WAVY AWAKEN WAVY

pack my box with five pack my box with five
rifling refined venezuela rifling refined venezuela
On the greatest and mo On the greatest and mo
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Hints compensate for low-resolution devices by thickening outlines so they don't break up at small sizes and by forcing some features to be symmetrical. TrueType (samples at left) can also rotate diagonals and make characters such as *w* and *m* wider.

Adobe's Type 1 font format, developed as the native format for use in the PostScript page description language (PDL). Until recently, you could use Type 1 fonts only on PostScript printers, because no one imagined it was possible to separate a font technology from the PDL of which it was a part. (In the same way, Hewlett-Packard's PCL bitmap fonts work only with LaserJets and other printers that use HP's Printer Control Language.)

Then, in 1990, ATM made the Type 1 technology available on any Windows-supported printer and monitor, so you no

Printing language that uses the specification	DOS applications that support the specification	Windows font scaler	WordPerfect font scaler
PCL 5 (LaserJet III)	All major applications (with PCL 5 printers only)	Intellifont-for-Windows, SuperPrint (requires conversion of outline file)	Fonts-on-the-Fly (DOS and Windows)
None	Many major applications (with explicit software support)	FaceLift for Windows, SuperPrint	FaceLift for WordPerfect (DOS only)
None	None	Microsoft Windows	None
PostScript	All major applications (with PostScript printers only)	Adobe Type Manager, FaceLift for Windows, SuperPrint	PrimeType for WordPerfect (DOS and Windows)

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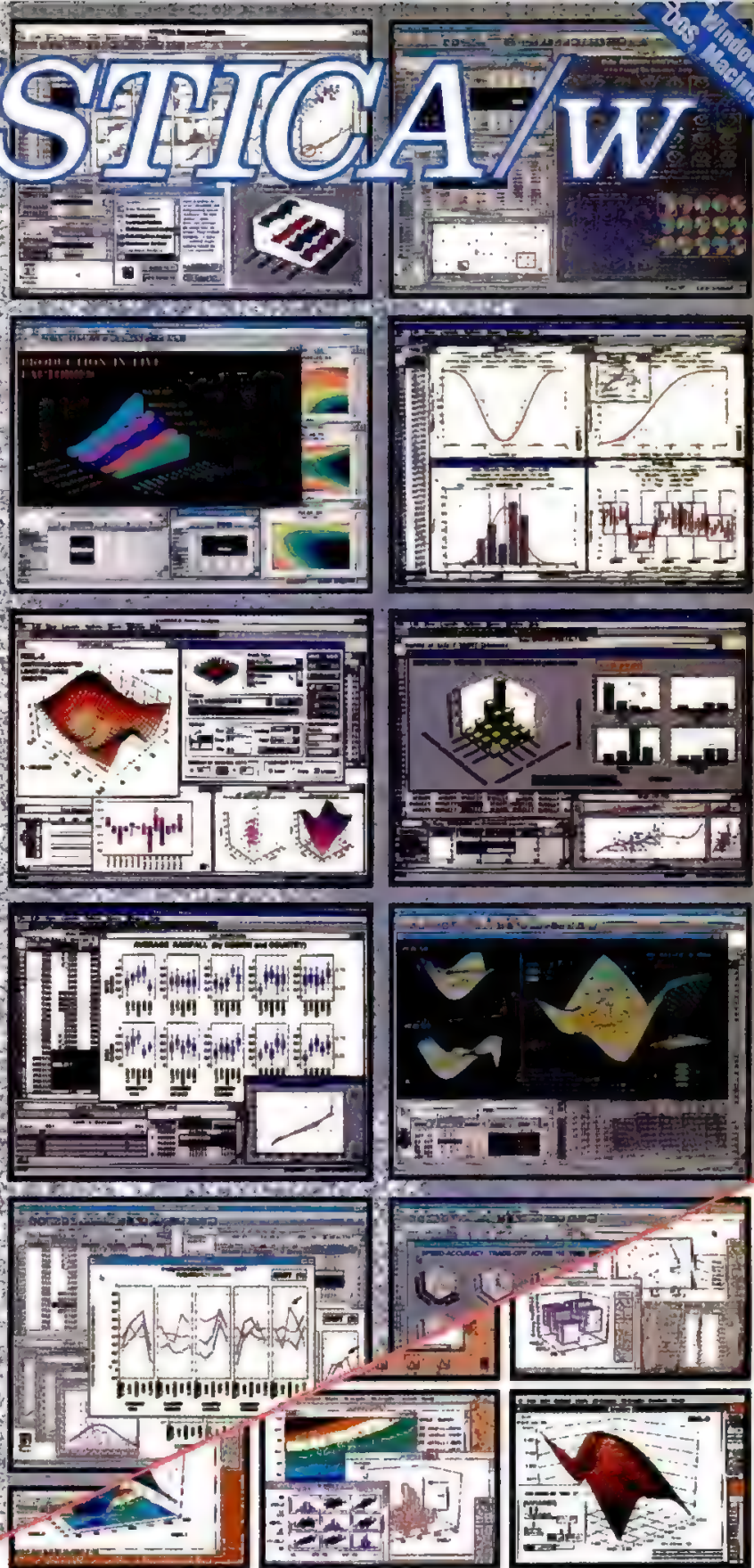
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you'll need to upgrade any fonts that have been revised to include the improvements. However, improved Type 1 rasterizers can prompt foundries to take the opportunity to upgrade their fonts. This year, for example, Adobe quietly reissued its Optima and ITC Eras packages without the much-maligned alternate outline in each font file that low-resolution printers used automatically. ATM technology had eliminated the need for a poorly drawn low-resolution outline in the same font file with a well-drawn high-resolution version.

WHAT WINDOWS SEES

Most users of scalable type now work in Windows, where the type they see on-screen closely approximates the printout and where they can find the widest range of applications with strong font support. The only DOS application that rivals Windows' support for scalable fonts is WordPerfect for DOS, which lets you work with a wider range of characters and symbols than you get in Windows, and offers printer drivers with far greater flexibility. The next version of WordPerfect will let you install and use almost any scalable font, although TrueType may not be supported until a later release.

Windows installs and uses fonts in different ways depending on their technology. TrueType is easiest: You don't need to buy or install an add-in utility, and the system learns everything it needs to know about each typeface from a single disk file.

You select font files (normally with the extension TTF) from a list in the Control Panel's Fonts menu, and they immediately become available to every application. During installation, the Control Panel creates a file (with the extension FOT) containing the location on-disk of the .TTF file and information about the font that Windows uses when deciding which font your application is asking for. You don't have to worry about damaging the .FOT file, because the installer can instantly re-create it from information in the .TTF file. Both the .TTF and .FOT files reside in your \WINDOWS\SYSTEM subdirectory.

If you have ATM and a non-PostScript printer, Type 1 fonts are almost as simple to install and use as TrueType fonts. ATM copies to the hard disk the

.PFB file that contains the typeface itself, and, using data from other files on the floppy disk, creates a .PFM file that contains the font metric information used by all Windows applications to determine the width needed for each character, and by desktop publishing applications to adjust the kerning between individual characters. (If you have a PostScript printer but you don't use ATM, applications still use this data for printed output, and to make screen display approximate printed output using whatever screen fonts Windows makes available to them.)

You have to restart Windows before you can use any new fonts you install, but the newly installed fonts are then available to every printer. If you turn off ATM, your Type 1 fonts won't be available for the screen, or for printing on non-PostScript printers, until you turn it on again.

Ironically, the only way you're likely to have trouble with Type 1 fonts is if you use a PostScript printer. If a PostScript printer is installed on your system, ATM inserts in WIN.INI a line for each new font under a heading that identifies the port to which your PostScript printer is attached. If you change printer ports, you may discover that your Type 1 fonts are suddenly unavailable, and you'll have to reinstall them via ATM or edit WIN.INI to get them back. Font management with current Windows PostScript drivers is a nightmare for many users; see our list of tips for ways to ease the pain.

SPEED RACING

TrueType on the Macintosh earned a reputation for slow performance from which it has never recovered. In Windows, however, TrueType is a speed demon. Microsoft, having observed Apple's misfortunes with TrueType, hunted down the speed bottlenecks in Windows TrueType and optimized the font technology to work at top speed with different printer technologies.

Before TrueType, scalable font technologies for Windows (including ATM when printing to non-PostScript printers) generated a graphic image of every char-

acter on every page in your document and sent those pages to the printer to be processed slowly as graphics. If your document used the 12-point letter *s* a thousand times, these technologies sent a thousand graphic images of *s* to the printer—an enormous waste of time and resources.

In contrast, with TrueType fonts, Windows prints text in the fastest way normally used by the technology in your printer. For example, if you use a LaserJet, and your document uses 12-point Arial type, Windows rasterizes a 12-point

PCL 4 bitmap font from the TrueType scalable outlines and automatically downloads it to the printer. This means that the graphic image of a 12-point *s* is downloaded to the printer only one time—in the bit-mapped font—and the document prints

as text, not as a graphic.

If you use TrueType with a PostScript printer, Windows generates and downloads one of two different kinds of PostScript fonts depending on the point size of the font and the resolution of the printer. For the smallest sizes, Windows generates a PostScript bitmap font—a font format now seldom used otherwise, but which produces better output than a Type 1 outline scaled to a small size. For larger sizes—15 points or larger on a 300-dpi printer—Windows generates a separate Type 1 scalable font outline optimized for each specific size needed, and lets the PostScript printer rasterize them the way it rasterizes the Type 1 fonts you buy from Adobe. These fonts aren't hinted, but they don't need hints, because the hints in the TrueType fonts were used to determine their optimal shapes.

At sizes above 36 points on a 300-dpi printer, Windows downloads a single scalable Type 1 outline and lets the printer rasterize it for all sizes used in the document. (The two thresholds are defined as 63 pixels per em and 150 pixels per em, and exact point sizes vary with the font and the resolution of the printer.)

For further speed savings, the downloadable fonts generated for both PCL and PostScript printers contain only the

*Ironically, the only way
you're likely to experience
trouble with Type 1
fonts is if you use a
PostScript printer.*

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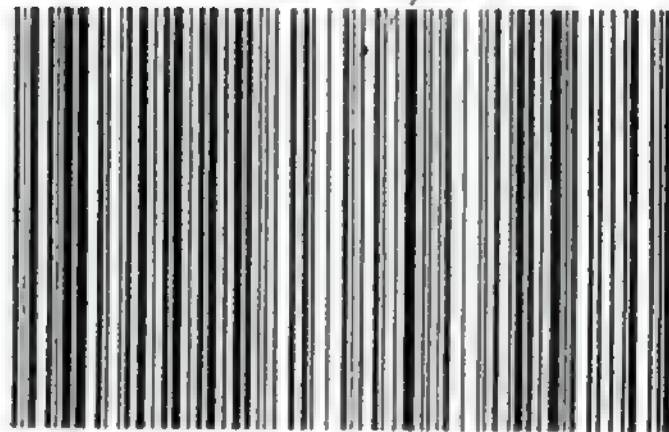
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1. Follow instructions on the other side

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Inverted Back

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4. Close the page and slip-sheet

3. Slice the folded edge

2. Arrow pointing to the fold

1. Front side touching the free page

2. Insert this sheet with

1. Open the foldout page

Foldout slip-sheet



GbsSlipSheet-001



Inverted Foldout slip-sheet

1. Open the foldout page

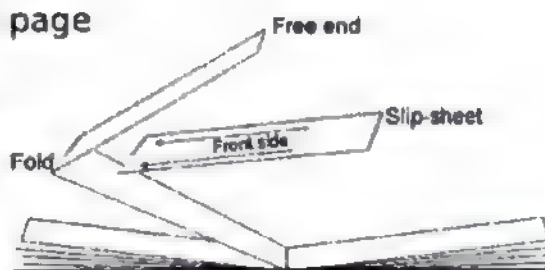
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet





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characters needed to print your documents. Conventional soft fonts take longer to download because they contain the full character sets.

Even before TrueType, some font utilities were smart enough to generate and download PCL 4 fonts when printing to LaserJets. Bitstream's FaceLift for WordPerfect works this approach with Speedo fonts, and GeoWorks uses the same technique with its Nimbus-Q scalable fonts. FaceLift 2.0 for Windows generates PCL 4 fonts from both Type 1 and Speedo typefaces and PrimeType for WordPerfect does the same with Type 1. There is no reason why a future version of ATM can't do the same.

Most other type scaling technologies, however, lack the advanced tools that TrueType offers for optimizing speed and appearance, especially on the coarse resolution of the screen. TrueType, for example, lets characters such as *w* and *m* occupy slightly more width at small sizes than they need on the printed page. This *nonlinear scaling* enhances readability and allows characters that would otherwise look distorted to look symmetrical.

OTHER FORMATS, OTHER PLATFORMS

You can use scalable technologies besides TrueType under Windows, but they all require add-on software such as ATM if you want to view your fonts on-screen (see the sidebar "Beyond TrueType: Font Scalers"). Intellifont, from the Agfa Division of Miles Inc., is built into the LaserJet III and subsequent Hewlett-Packard printers, and is supported by virtually all business applications. Intellifont, however, offers limited typographic resources—only around 200 Intellifont typefaces are now on the market—and you can normally use it only with the LaserJet III series, not earlier models. The one application that uses Intellifonts with all printers is WordPerfect when combined with LaserTools' Fonts-on-the-Fly.

Two other technologies offer lesser quality. Bitstream's compact but proprietary Speedo font format is built into many DOS applications and is supported under Windows by Bitstream FaceLift for Windows. Digital Typeface Corp.'s Nimbus-Q technology—with still lesser quality—is built into the GeoWorks operating environment and other DOS applications.

Compared with TrueType, all other

Converters: *Almost True to Type*

by Edward Mendelson

If you can only find the typeface you need in a format you can't use, font conversion programs may be the answer—if you accept an inevitable loss in quality and changes in the original design. It is mathematically impossible to convert perfectly between formats, because curves used by one can only be approximated by another. Even when you can convert perfectly between unhinted fonts, there is no known way to convert hints from one format to another. Without hint conversion, the best font you can get out of a converter is an approximation of the font you put into it.

The best converter now available on the PC is FontMonger (\$149.95; Ares Software Corp.; Foster City, California; 800-783-2737). This Windows utility imports and exports TrueType, Type 1, Type 3, and Nimbus-Q formats; it also imports but doesn't export Intellifont, LaserMaster LXO, and CorelDRAW's .WFN. You can import multiple fonts simultaneously and copy characters from one to another. More skilled users can edit the typeface outlines, although there is limited control over font metrics.

FontMonger automatically applies hints to exported TrueType and Type 1 fonts, but only through generalized autohinting, not the custom hints for individual characters that you find in the best commercial fonts. FontMonger's autohinting is highly effective, although it has a slight tendency to homogenize the original design.

The more powerful and expensive Fontographer for Windows will arrive later this year (\$495; Altsys Corp.; Plano, Texas; 214-680-2060). Already the most popular font editor on the Macintosh, Fontographer allows total control over font outlines and metrics, with custom hinting for Type 1 fonts and autohinting for TrueType. Unlike FontMonger, Fontographer works only with these two formats.

AllType (\$79.95; Atech Software;

Carlsbad, California; 800-786-3668) lets you convert fonts among TrueType, Type 1, Type 3, Nimbus-Q, and Intellifont, but doesn't let you edit fonts. AllType's conversions produce more distorted output than FontMonger's, but it is the only converter that exports to Intellifont format—and it gives you a full choice of Intellifont character sets.

FontMonger and AllType let you convert from Bitstream's now-abandoned Fontware format if you use



FontMonger lets you move characters between different font files and edit character outlines.

Fontware to generate a Type 3 font and then use the converter software to generate a different format.

The MoreFonts font-scaling package isn't marketed as a conversion utility, but when used with two add-ons, you can import Type 1 fonts and export them in TrueType or Intellifont formats. Export quality is slightly better than AllType's. The basic MoreFonts package costs \$149.95, the Type 1 import utility costs \$39, and the export package comes with \$99.95 typeface packages (MicroLogic Software, Emeryville, California; 800-888-9078). And don't forget Wrefont (see the tip "Thirteen utilities to manage fonts").

Monotype's forthcoming Font-Mixer will let you swap characters between Type 1 fonts without altering outlines or losing hints. It's the only program that will perfectly copy old-style numerals from an "expert set" font to a normal font (Monotype Typography Inc.; Chicago, Illinois; 800-666-6897). □

Where to Find TrueType

Vendor	Location	Telephone	Product	Quality
Agfa Division, Miles Inc.	Wilmington, MA	800-424-8973	Desktop Styles: 39 text and display fonts, \$79. Type Jamboree: 46 text and symbol faces, \$99. 30 volumes of 4 to 6 faces each, \$59.	Excellent
Alphabets Inc.	Evanston, IL	708-328-2733	16 text and display faces, \$74.95 to \$134.95 per family.	Excellent
Architext Inc.	San Antonio, TX	512-490-2240	Text, display, and foreign fonts produced on special order.	Not rated
Bitstream Inc.	Cambridge, MA	800-522-3668	Text and display faces. TrueType FontPack 1: 40 faces, \$79. TrueType FontPack 2: 20 faces, \$39. Type Essentials: 4 packages with 7 to 13 faces, \$69 to \$109.	Excellent
Casady & Greene Inc.	Salinas, CA	408-484-9228	Text and display faces. Fluent Laser Fonts Library: 120 fonts, \$179.95. Eastern European Fonts: 17 fonts, \$200. Glasnost Cyrillic Library 2: 17 fonts, \$200. Individual 4-font volumes, \$69.95 to \$89.95.	Good
Castcraft Software Inc.	Skokie, IL	708-675-6530	OptiFonts, Volume 1: 400 text and display fonts on CD-ROM, \$996.	Mixed
Castle Systems	San Rafael, CA	415-459-6495	17 display fonts, \$79 each; 2 fonts in the same family, \$109; 3 fonts in the same family, \$139.	Excellent
Data-Cal Corp.	Chandler, AZ	602-545-1234	WorldFont for Windows 3: includes key mapper and 76 fonts (Arabic, Armenian, Cyrillic, Greek, Hebrew, Katakana, Thai, and Latin alphabets), \$249; sets of 4 or 5 fonts, \$99.95.	Mixed
The Electric Typographer	Santa Barbara, CA	805-966-7563	30 script and display fonts, \$45.00 to \$79.95 per family.	Excellent
Elfring Soft Fonts	Wasco, IL	708-377-3520	Top Fonts: versions of 75 popular faces, \$199.50. KeyCaps font family: \$95.	Good
Emigre	Sacramento, CA	916-451-4344	71 fonts, mostly display, packages of 2 to 4 fonts, \$65 to \$125.	Excellent
EMS Professional Shareware	Olney, MD	301-924-3594	TrueType Font Library: 400 shareware and public-domain fonts, \$49.50.	Mixed
FontBank Inc.	Evanston, IL	708-328-7370	Display faces. FontBank Type Companion: 250 fonts, \$95. The FontBank 75: 75 fonts, \$75. FontBank Scripts: 10 fonts, \$24.95.	Excellent
Image Club Graphics	Calgary, Alberta, Canada	800-661-9410	Windows 3.1 TrueType Library: 620 text and display fonts, \$15 to \$100 per family.	Mixed
IQ Engineering	Sunnyvale, CA	800-765-3668	SuperType Master Library: 93 popular text and display fonts, \$200.	Very good
Kabbalah Software	Edison, NJ	908-572-0891	72 Hebrew fonts, \$35 to \$49 per family of 4.	Very good
LaserGo Inc.	San Diego, CA	619-450-4600	LaserGo Type Commander: 2 sets of 70 popular text and display fonts, \$99 each; third set of 10 fonts, \$99.	Mixed
Lazy Dog Foundry	St Paul, MN	800-876-9807	Lazy Dog Foundry Fonts: 2 sets of 10 display fonts, \$99 per set.	Very good
Letter-Perfect	Gig Harbor, WA	206-851-5158	18 display fonts, \$65 to \$175 per family.	Excellent
Microsoft Corp.	Redmond, WA	800-426-9400	TrueType Font Pack for Windows: 44 text and display fonts, \$79.95 (licensed from Monotype and Bigelow & Holmes).	Excellent
Monotype Typography Inc.	Chicago, IL	800-666-6897	TrueType Value Pack: 57 text and display fonts, \$89. Desktop Solutions 1, 2, and 3: 8 to 12 fonts each, \$129 each. Presentation FontPack: 5 display fonts, \$59.95.	Excellent
Photo-Lettering Inc.	Evanston, IL	708-328-7380	13 display fonts, \$14.95.	Excellent
Quadrat Communications	Toronto, Ontario, Canada	416-960-0606	10 text and display fonts, \$35 each; families, \$60 to \$120.	Excellent
Qualitytype	Southfield, MI	800-950-2921	Font Value Pack for Windows: 150 text and display faces, \$99.	Not rated
RoadRunner Computing	Baton Rouge, LA	504-346-0019	RRKeyFonts for Windows: 2 keycap fonts, \$54.	Excellent
SoftKey Software Products Inc.	Boca Raton, FL	407-367-0005	Keyfonts for Windows 3.1: 101 fonts without high-order characters, \$49.95. Keyfonts/Professional for Windows 3.1: 126 fonts with high-order characters, \$79.95.	Good
SWFTE International	Hockessin, DE	800-237-9383	TypeCase: 131 text and display fonts, \$69.95.	Mixed
Upgrade Systems Corp.	Naples, FL	800-383-3668	TrueType Font Pack for Windows: 600 text and display fonts, \$129.	Mixed
WinGreek	Scarborough, Ontario, Canada	None	1 Greek and 1 Hebrew font, \$35 (registration fee).	Very good

font technologies have the advantage of support in both DOS and Windows. We have heard, however, that the next version of Microsoft Word for DOS will support TrueType with most printers, and will use TrueType for screen fonts in Word's uneditable preview screen. On the printer side, vendors such as Agfa and Bitstream have devised technologies that let printers work directly with TrueType and other major font formats—with no

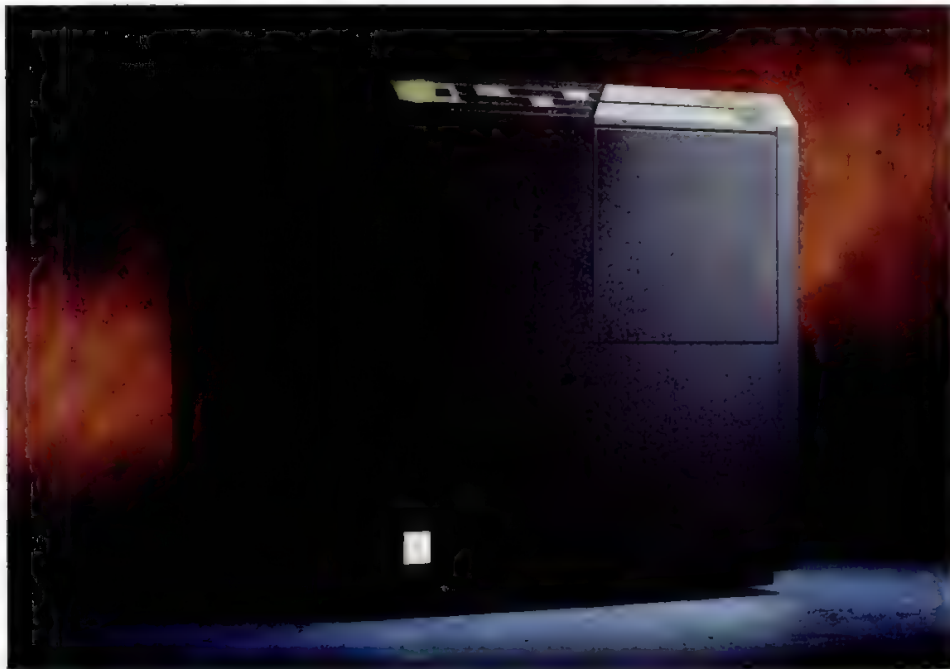
need for Windows. Printers that include this kind of technology may be on the market before the end of 1992. TrueType support in major DOS applications will follow quickly.

SELECTING AND BUYING

TrueType shines as a technical marvel, but Microsoft and Apple have implicitly positioned it for the mass computer market, not for the design professional. Be-

fore Windows 3.1 appeared, the best Type 1 fonts typically cost \$185 for a family of four. Then Microsoft pushed font pricing into a downward spiral by offering 44 fonts in its TrueType Font Pack for Windows at \$79.95. These fonts were well-engineered designs licensed from Monotype and Bigelow & Holmes, although they lacked the kerning data found in most Type 1 fonts and in many TrueType fonts issued afterward. But

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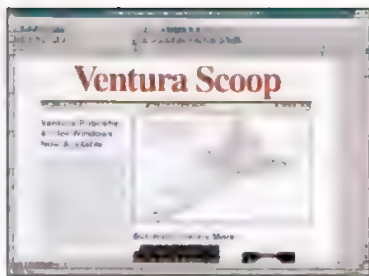
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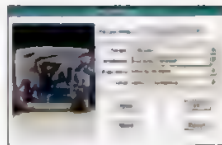
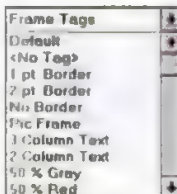
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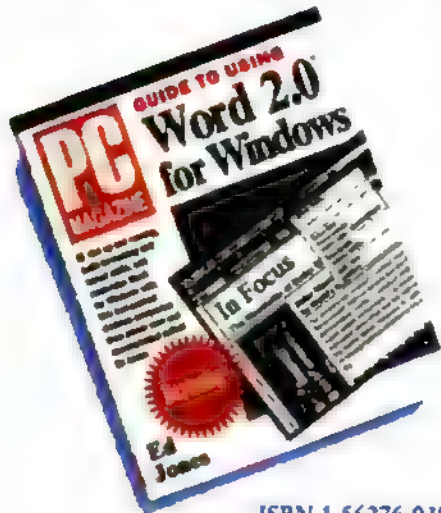


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Microsoft sold hundreds of thousands of packages, and other font vendors set their TrueType prices in the same region.

Type 1 prices have begun to drop, but not to the level of many TrueType packages. One hint of the future may be Adobe's Type Set Value Pack, with 30 superb designs for \$60. Type 1 fonts on CD-ROM—long available for the Macintosh—are appearing in greater number for the PC, and some CD-ROM prices work out to a couple of dollars per font. CD-ROMs with TrueType may begin to appear this year.

The most convenient way to buy fonts may be to download them from a commercial service directly into Windows. The first such downloading service, Connect Software's Font Connection (800-234-9497), will offer TrueType fonts exclusively when it starts operating in the third quarter of 1992.

KEEPING UP WITH THE FOUNDRIES

A year ago, *PC Magazine* reviewed the offerings of the larger font foundries ("Beyond Times and Helvetica: Scalable Fonts for the PC," September 24, 1991). Today, all the major foundries are in a stronger position than before: Some have introduced new distribution methods, and most have begun to add TrueType to their Type 1 or proprietary-format libraries. For TrueType offerings by these foundries, see the table "Where to Find TrueType."

Adobe Systems (Mountain View, California; 800-833-6687), the most prominent PC type foundry, releases Type 1 fonts only. Its library includes more than 300 packages priced from \$49 to \$370, each with a family of 1 to 16 fonts. Selected *Type Sets* with as many as 11 families are priced from \$149 to \$198. Adobe's latest releases include the exuberant script face Poetica, complete with hundreds of alternate characters, and Adobe's first Cyrillic face. (Refer to the sidebar "The Best of the New Type 1 Fonts.") Adobe's "expert set" fonts contain many typographic refinements, and Adobe Caslon still ranks as perhaps the

finest digital typeface family ever designed.

Agfa Division, Miles Inc. (Wilmington, Massachusetts; 800-424-8973), formerly Agfa Compugraphic, now issues its most popular designs in both TrueType and Intellifont, and has begun to release more specialized faces in Type 1 format, generally priced at \$185 per package of four. These faces include some highly unusual calligraphic fonts such as Aurora and Nadianne.

Bitstream Inc. (Cambridge, Massachusetts; 800-237-3335) promised for years to release its 1,100-font Type 1 library in PC format. This year, just when type lovers had given up hope, it delivered. (Prices: \$129 for four fonts; approximately \$66 each for three or more of these four-font packs.) Separate packages will also be

available in stores, and the TrueType version of the library may follow later this year, with relatively low prices for owners of Type 1 versions. Bitstream's latest designs include some excellent original text faces, including Arrus and Iowan Old Style, but Bitstream still has no fonts with true small capitals or old-style numerals.

Linotype-Hell (Hauppauge, New York; 516-434-2000) cross-licenses its Type 1 library with Adobe, and is moving slowly into the TrueType market. Recent Type 1 issues include updated versions of the workhorse Fairfield family and the classic Didot face. Prices are similar to Adobe's.

Monotype Typography (Chicago, Illinois; 800-666-6897), with more technical expertise in TrueType than any other foundry, also continues to expand its Type 1 library with digitized versions of subtle designs such as Dante and extensive series of expert sets. Individual packages—including Adobe packages—are priced slightly lower than Adobe's, typically \$160 for four faces. But \$49.99 gets you Monotype's complete Type 1 library on a CD-ROM with any eight fonts available for immediate use. You unlock further fonts at prices ranging from \$40 to \$25, depending on the number ordered.

Large foundries aren't the only source

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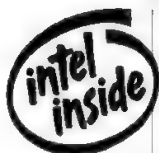
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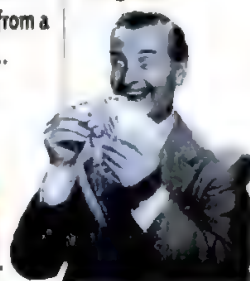
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486DX/33 CACHE	Intel 80486DX-33 MHz 128K CPU cache	as above	120	as above	16 bit SVGA card, 1MB Video RAM & Hi-Color Support, 14" 1024x768 SVGA Non-Interlaced Multisync Color Monitor	\$1,799* \$67/mo*
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486DX2/66 CACHE	Intel 80486DX2-66 MHz 128K CPU cache New Double Clock CPU	8 standard 32 max	200	as above	16 bit SVGA Superfast Windows Accelerator card, 1MB RAM, 14" 1024x768 SVGA Non-Inter- laced Multisync Color Monitor	\$2,499* \$93/mo*

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for well-designed fonts. Some of today's most popular and stylish typefaces are the work of boutique-style foundries that until recently catered only to the Macintosh market. Some of the best are listed in the tip "Finding unusual fonts."

PORTABILITY

The next advances in font technology will bring two major changes. First, special typefaces will be designed that can change their shape to fit available space or to produce the best results at different point sizes. Second, digital typefaces will be designed to be transportable with electronic documents, so that documents can look the same when viewed on a computer that doesn't have the document typefaces installed. Both developments are linked, and both are already beginning to appear on the market.

Typefaces designed to change their shape differ radically from ordinary typefaces that are compressed or stretched or otherwise mauled by common utility software. Existing fonts suffer such severe distortions when compressed or stretched that the modified fonts are too ugly or illegible to use. In 1991, Adobe introduced its Multiple Master extension to its existing Type 1 technology as a way around this problem. The first Multiple Master fonts arrived (for the Macintosh only) early in 1992.

A Multiple Master typeface file contains up to 16 pairs of Type 1 scalable outlines. Each pair defines the endpoints of an imaginary design axis, such as thick and thin. Users or applications can interpolate a custom typeface outline at any point between those endpoints. If you want to fit the text of your document on a single page, an application that supports Multiple Master can create an outline whose width allows the text to fit exactly on the page. Other axes might be defined as extending from a serif to a sans serif variety of a single design, or from a variety optimized for small sizes to one optimized for large sizes.

Multiple Master faces are fiendishly difficult to design effectively, and only two faces are available now, both from Adobe and both usable only on the Macintosh. Software that supports Multiple Master on the PC may arrive in 1993. Similar capabilities are possible in TrueType, but they are not yet part of the

Apple/Microsoft specification.

The second impending advance involves transportable documents. Here TrueType currently has the advantage. TrueType vendors can "flag" fonts so that applications will be able to embed the font itself within documents that use that font. Imagine that your document uses a TrueType font that the font vendor has flagged as an embeddable "print-and-preview" font. You can save the document so that it contains a subset of your font with all the characters needed to display and print the text. If you give the document to a colleague who does not have that font installed on her computer, she will be able to read and print the document, but she won't be able to modify it, and she won't be able to use the font in any other document.

Embedded fonts can also be flagged as "installable," which will let your colleague install the font on her system if she doesn't already have it, and use it for creating and printing any documents she likes. The 14 fonts that ship with Windows are flagged as installable, but most fonts will either be flagged as "print-and-preview" (read-only) or as not embeddable at all. Microsoft's PowerPoint supports embedding now, and Microsoft and major font vendors have begun to discuss further varieties of embedding that may be introduced in the future.

Adobe's solution to the problem of transportable documents is more radical. Instead of sending fonts with a document, Adobe proposes a technology called Carousel that will use Multiple Master fonts to approximate the original fonts when you view documents on a computer or platform that doesn't have the document's original fonts installed.

Until these technologies arrive, documents that use Type 1 fonts have one major advantage. Because Type 1 is supported on all platforms, a document that uses Type 1 fonts can be printed virtually interchangeably on any platform. Virtually interchangeably—but not entirely. Although the encoded data that defines the shape of the characters is the same in Type 1 files on all platforms, some ASCII data in the file differs on each platform, and different platforms use slightly different files to tell the system all the details of font metrics. Also, font-naming conventions differ on different platforms,

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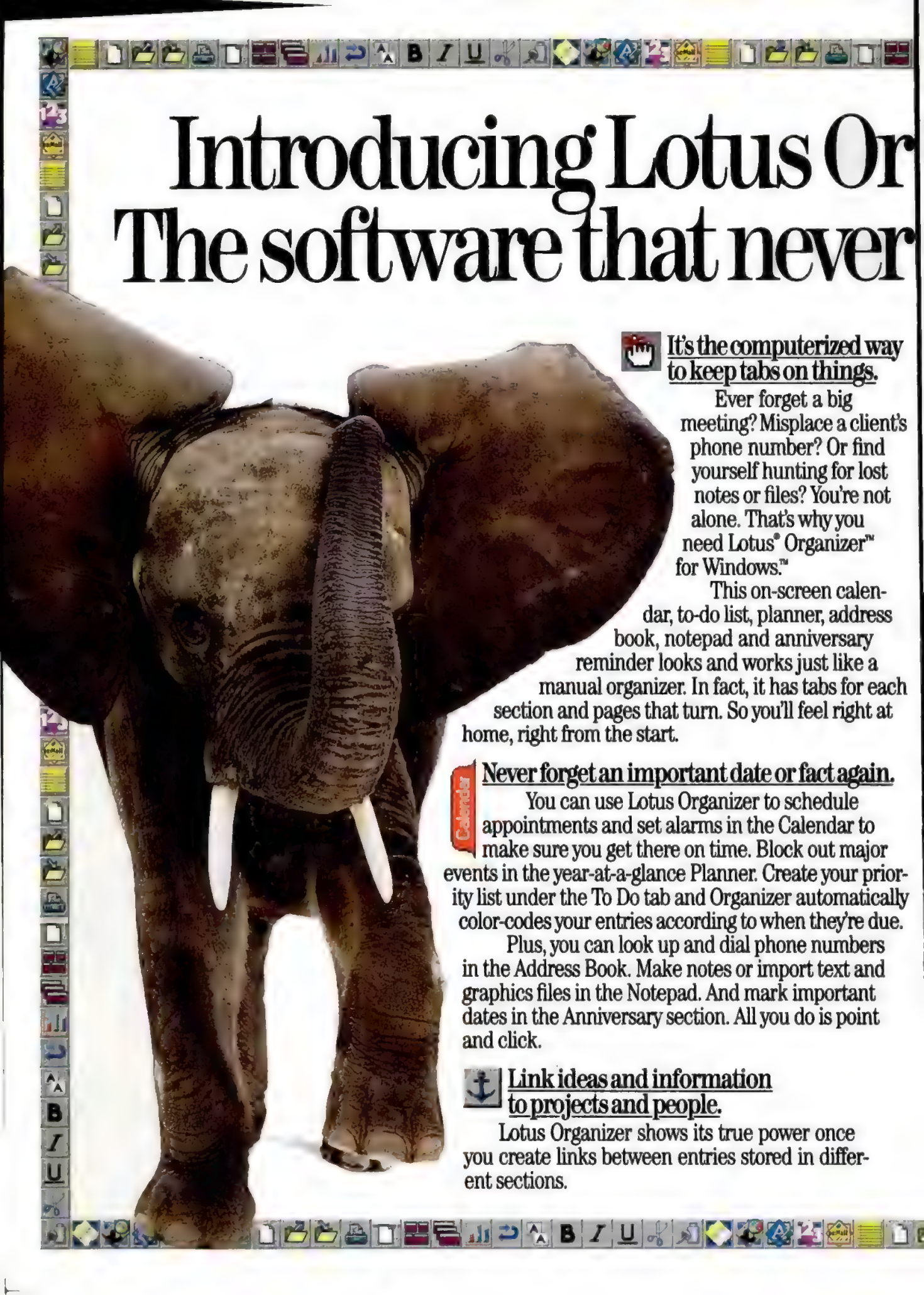
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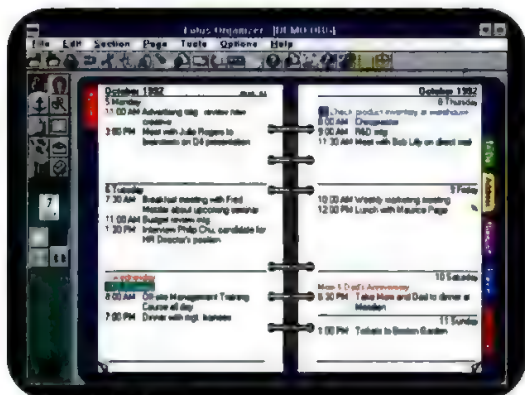
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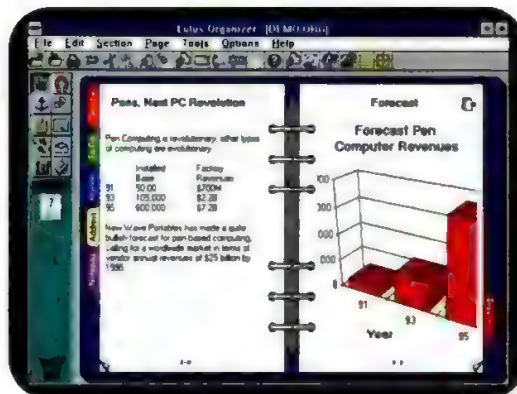


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so a document created in Windows may end up with different Type 1 fonts when you load it on a Macintosh.

If you want to interchange files between the Mac and Windows only, however, TrueType provides a more seamless solution: The two platforms normally use identical TrueType files. Although it's possible to create TrueType fonts with metric information for one platform or the other, vendors that follow Microsoft's specification will create fonts that contain character mapping and metric information for both platforms. Each platform transparently finds in the file all the data it requires for formatting and printing.

Once you have your fonts, you still may have to work your way through a thicket of font management problems, and you may want the customization and convenience that the best font utilities make possible. It's easier than ever to use fonts, but you'll still need skill and ingenuity to use them well.

Optimizing

► **Upgrade to Windows 3.1 and ATM 2.x** Don't even think about beginning to optimize font usage on your system until you move up to Microsoft Windows 3.1 and Adobe Type Manager 2.x. You're going to end up installing Windows 3.1 anyway, so take care of it now and gain access to the TrueType fonts and improved printer drivers that ship with it. If you use ATM, get the most recent version for its increased speed and improved font installation for PostScript printers.

If at all possible, don't install Windows 3.1 over Windows 3.0, but start fresh. That way, you'll end up with fewer unidentifiable fonts that you don't need cluttering up your system. If you must install Windows 3.1 over a copy of 3.0 (for instance, if you need to preserve the settings for hard-to-install applications), reinstall ATM 2.x and then reinstall your fonts from the original floppy disks. You'll gain access to a larger character

set than was possible with earlier versions of ATM, and your soft fonts will be correctly installed for automatic downloading with PostScript printers.

► **Install only the fonts you need**

Every font that you install in Windows slows the loading of Windows and the loading of most applications that use fonts. You also lose a few bytes of memory with every TrueType and ATM font loaded; you won't notice the effect, though, until you have hundreds of fonts installed. To

cope with font overload, uninstall TrueType and ATM fonts that you don't plan to use—doing so won't delete them from your hard disk (unless you tell the TrueType installer to do so) and reinstallation takes only a few seconds.

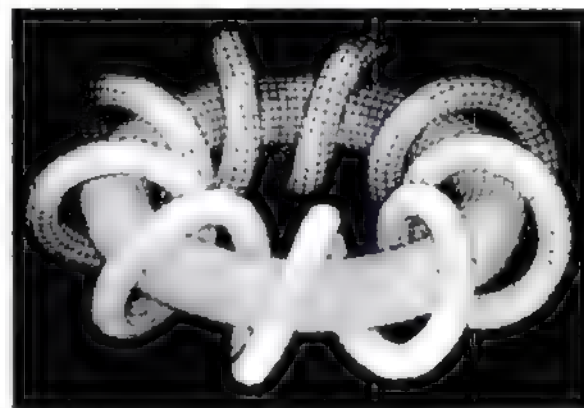
► **Clean out obsolete Windows screen fonts** If you installed Windows 3.1 over a copy of 3.0, your system may be cluttered with Windows screen fonts that your applications no longer use. Start housekeeping by looking in the [Fonts] section of WIN.INI. TrueType fonts are listed with an FOT extension; bitmap and the obsolete Windows vector fonts have an FON extension.

Of the TrueType fonts listed, you need all the listed weights of Courier New, Times New Roman, and Arial, as well as the Symbol and WingDings fonts. Among the bitmap fonts, Windows requires at least MS Serif, MS Sans Serif, and Small Fonts. (MS Serif and MS Sans Serif are the same as the old Tms Rmn and Helv screen fonts.) You will also want to keep the bitmapped Courier and Symbol fonts to ensure optimal screen display.

You probably don't need the three vector fonts, Roman, Script, and Modern. You can force Windows to ignore them by commenting out their lines in WIN.INI; do this by inserting a semicolon as the first character of the line. Don't delete the corresponding .FON files from your WINDOWS\SYSTEM directory just yet, because it's possible that an application will look strange without them.

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(If you use a plotter instead of a printer, keep the vector fonts. Plotters can't use TrueType.)

You won't find some .FON files listed in WIN.INI, but Windows needs them anyway. Make sure you don't delete any .FON files with names that begin VGA*, EGA*, or 8514*, and don't delete DOSAPP.FON, which Windows requires to display your DOS applications in a window.

You may need other screen fonts that have been installed by applications. For example, Word for Windows adds the MT Extra, Fences, and MS Line Draw fonts, and Ami Pro 3.0 adds Lotus-LineDraw. If you see fonts whose names include a vendor's name, make an educated guess about whether you need the font. If you decide that you don't, then comment out the line. If your applications subsequently work without problems, back up the font files (which are probably stored in your WINDOWS\SYSTEM directory), and delete them from your hard disk.

Long-abandoned software may have left behind fonts with names such as Ruler, Digital, Preview, and Symantec SF. Many of these fonts were rendered obsolete by TrueType; but comment them out of WIN.INI and back them up before deleting.

► **Clean out unwanted PCL 4 and Speedo fonts** Unless you use bit-mapped LaserJet soft fonts, or you use Bitstream Speedo fonts with FaceLift in DOS applications, you can safely remove these files from your disk. Look for directories named PCLFONTS or BTFONTS, back up their contents, and remove them from your hard disk. If you use PCL 5 fonts (the scalable fonts for the LaserJet III series) don't delete any fonts with the extension SFS when you clean out the PCLFONTS directory.

► **Use ATM for Type 1 housecleaning** If you use a PostScript printer, you probably have assorted Type 1 font files and font metric files scattered around your hard disk, and it is likely that the fonts that the ATM control panel tells you are installed don't match the fonts that are listed in WIN.INI for your printer. Also, if you use more than one printer port, the soft fonts available for

one port probably don't match those available for the others. Here are the steps that you'll need to take to make everything work together.

► **Put your fonts in one place** Early versions of most vendors' Type 1 soft font installers put font metric files in your WINDOWS\SYSTEM directory. ATM and the current Adobe installer more sensibly put them in the PSFONTS\PFM directory. Use File Manager to display files with the extension PFM in both directories. If you have matching .PFM files in PSFONTS\PFM and WINDOWS\SYSTEM, delete them from the latter. Move all others to PSFONTS\PFM.

Temporarily remove all fonts from WIN.INI (You will not delete the font files.) Make a secure backup of WIN.INI, then open it in a text editor such as Notepad. Look for all sections with headings such as "[PostScript,LPT1]". You'll see one such heading for each printer port you use. Under each of those headings, delete all lines that begin "softfont#=" and the line that begins "softfonts=#" (in each case, "#" represents a number). Don't interfere with similar sections with names such as "[HP LaserJet III PostScript,LPT1]," where the heading is the name of a printer, not just "PostScript."

Save the revised copy of WIN.INI.

Temporarily remove all fonts from ATM First, open ATM's control panel, select all the listed fonts, and then select Remove. (Alternatively, you can make a backup of ATM.INI, then, in a text editor, delete all the lines that lie between the heading [Fonts] and the next heading.) Finish by restarting Windows.

Reinstall only the fonts you need Start by opening the ATM control panel and clicking on Add. In the dialog box that pops up, double-click on the PSFONTS\PFM directory, select all the fonts you would like to use, and install them. When you restart Windows your chosen fonts will be available again, and they will all be stored in a single directory so that you are able to keep track of them easily.

A new version of ATM due out from Adobe later this year will let you remove fonts from WIN.INI via a menu selection. In the meantime, Ares Software's \$79.95 FontMinder lets you perform these tasks from a menu, and it also lets you delete unwanted fonts from your hard disk (see the sidebar "Converters: Almost True to Type" for more information). The font manager that is included with LaserMaster's WinJet add-in boards and WinPrinter printers also automatically reconciles ATM.INI and WIN.INI.

Keeping Your Font Files Straight

To keep track of your fonts, you need to know what all those obscure filenames mean. Here's a brief guide to the most common types.

INTELLIFONT

.SFP or .SFL PCL 4 bitmap font file; can also have virtually any other extension, most often .R8P.

.SFS PCL 5 scalable font file

.TFM Tagged font metric file. Includes information used by installation software.

SPEEDO

.SPD Speedo scalable font file.

.TDF Typeface definition file. Includes information used by installation software.

TRUETYPE

.FOT File created by the Windows font installer from information in the .TTF file. It has data

Windows needs to find and select the TrueType font.

.TTF TrueType font file.

TYPE 1

.AFM ASCII file with metric information for a Type 1 font. Used by ATM and soft font installers to create the .PFM file. Modifiable by expert users.

.INF Font information file. Used by Adobe Font Foundry and soft font installers when creating and installing LaserJet fonts. Modifiable by expert users.

.PFA Type 3 font file. Unhinted font files that can be printed on PostScript printers but cannot be used by ATM. Type 3 fonts use the same .AFM and .PFM metric files as Type 1 fonts.

.PFB Type 1 font file; has partial font metrics.

.PFM Windows font metric file; created by font installers. Modifiable by many Windows utilities.

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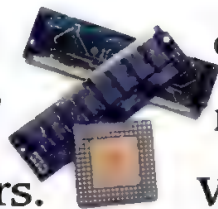
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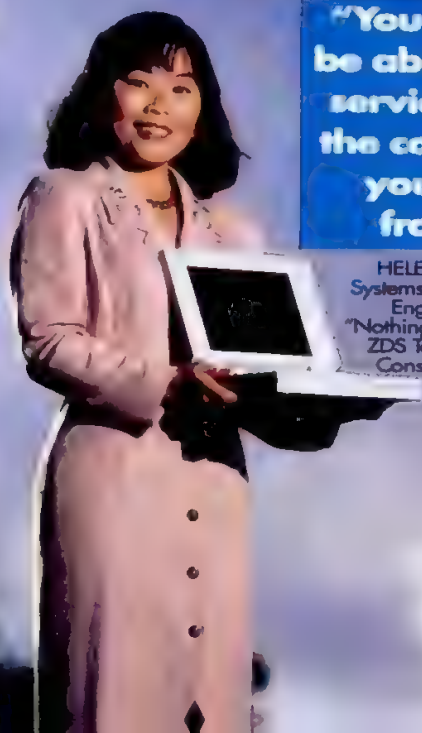
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► **Harness substitution tables** Windows and ATM together have four kinds of tables that let you use one font in place of another. You may not ever need to touch any of them, but they are useful when you need to troubleshoot or customize the way Windows handles missing or unavailable fonts.

Substituting TrueType fonts for bitmap fonts WIN.INI includes a section

headed "[FontSubstitutes]," with entries in this form:

Helv=MS Sans Serif

The name on the left is the name of a font that some older applications expect to see. The name on the right is the one that Windows 3.1 uses instead. You can use this section to substitute TrueType fonts

for bitmap fonts that you used in older documents. If you want to use the TrueType Arial font instead of the bitmapped MS Sans Serif font, for example, edit the line shown above (but you'll pay a slight penalty in speed and screen quality).

Substituting Type 1 fonts for TrueType fonts The PostScript driver uses a similar substitution table to tell Windows which PostScript fonts to use in place of

■ Beyond TrueType: *Font Scalers*

by Edward Mendelson

Windows is the first operating environment on the PC that lets you view and print fonts in more than one format at the same time. You can combine TrueType with third-party on-the-fly font scalars that let you use Type 1, Speedo, Intellifont, and proprietary-format fonts. And you'll gain access to thousands of fonts you can't find in TrueType format.

Adobe Type Manager, Version 2.0, *PC Magazine's* Editors' Choice font scaler in 1991, remains the best of the breed. It works only with Type 1 fonts, and produces the best output on-screen and on paper. It is slower to print than rival font scalars, but you won't mind the delay for the sake of its quality and reliability. Many Windows applications ship with ATM, so you probably have it already (\$99; Adobe Systems Inc., Mountain View, California; 800-833-6687).

FaceLift 2.0 for Windows works at top speed with Type 1 and Speedo outlines, and lets you create fonts with alternate character sets when you use Speedo outlines. It also incorporates special effects such as shadows and outlines. Since it occasionally locks up your system and offers lower output quality than ATM, make FaceLift 2.0 for Windows your first choice only if you need its special features (\$99; Bitstream Inc.; Cambridge, Massachusetts; 800-522-3668).

SuperPrint, Version 2.2, the Swiss Army knife of font scalars, works with Type 1, Speedo, Nimbus-Q, PCL 4 bit-

mats; you have to convert the last two into intermediate formats before using them. SuperPrint (\$195; Zenographics Inc.; Irvine, California; 800-366-7494) works quickly and includes a print spooler. Separate versions support film recorders and other devices not normally usable with Windows. Output quality with Type 1 fonts is notably worse than with ATM, and the complexity of this package may daunt all

package, consider buying Agfa's TrueType equivalents of Intellifont typefaces (free; Hewlett-Packard Co.; Boise, Idaho; 303-353-7650).

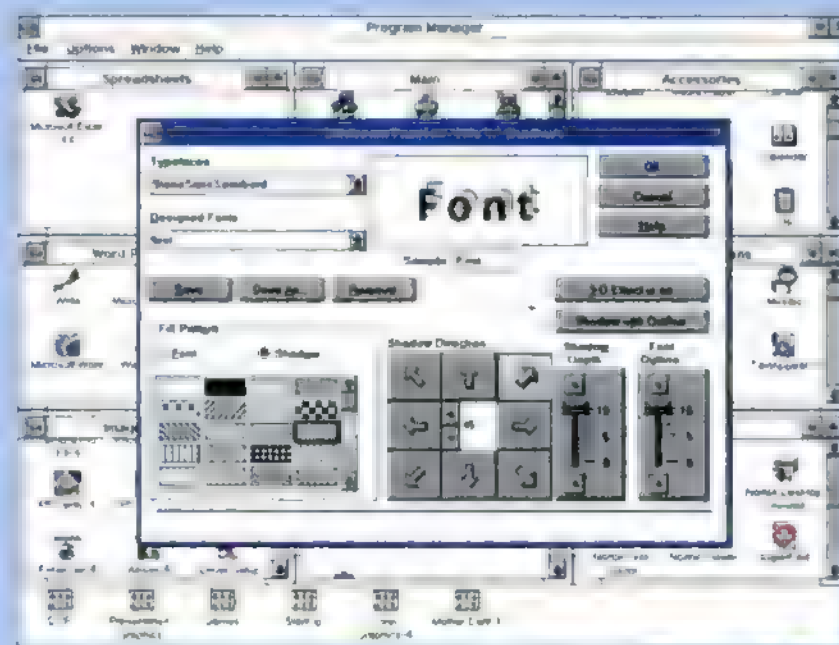
Two proprietary-format Windows font scalars are notable mostly for special features and effects, not for font quality. MoreFonts offers on-the-fly scalable fonts for Windows, WordPerfect, and other DOS applications, with shadows and other effects. With More-

Fonts loaded in Windows, you can use TrueType, ATM, and FaceLift fonts with WordPerfect printer drivers. (\$149.95; MicroLogic Software; Emeryville, California; 800-888-9078).

FastFonts, the successor to Publisher's Powerpak, includes special effects, a unique font metrics editor, and a feature that lets you import EPS graphics files

into a font (\$99.95; Atech Software, Carlsbad, California; 800-786-3668).

For WordPerfect, three on-the-fly font scalars produce fast printer fonts with larger symbol sets than you get from any other font products. LaserTools Corp.'s PrimeType works with Type 1 fonts with WordPerfect for both Windows and DOS (\$99; LaserTools Corp., Emeryville, California; 800-767-8004). The same company's \$99.95 Fonts-on-the-Fly works similarly with Intellifonts. Bitstream's \$99 FaceLift for WordPerfect provides scalable Speedo fonts, but works only with WordPerfect for DOS. □



FaceLift lets you add special effects to an entire typeface family.

but the most determined users. You get different output quality from different rasterizers because each uses different ways of rendering the curves and hints in the same Type 1 fonts. The technology in Adobe's rasterizer is one of the most guarded secrets in the industry, and no clone maker has matched it.

Intellifont-for-Windows, Version 3.1, works only with Intellifonts and the LaserJet III series, but it costs you only a phone call. Unless you need the alternate character sets supported by this

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INFORMATION IRRETRIEVABLE
*** FATAL DISK ERROR ***



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you used a bad com-
puter disk?

Sure you do. You

promised yourself that it was
the last time you'd ever use a
bad computer disk.

And it will be. If you remem-

ber to start using BASF disks.
Made by the people who in-
vented magnetic recording.

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BASF

TrueType fonts. You access this table from Control Panel's Printer menu; select your printer, and choose Setup, Options, Advanced. By default, the driver uses the table to tell Windows to use the printer's built-in Type 1 fonts instead of downloaded TrueType fonts. But if you prefer the look of the corresponding TrueType fonts, tell the driver not to use the substitution table; clear the check mark next to Use Substitution Table.

Using TrueType for display and printer fonts for printing If you want to use TrueType only on-screen, and save time and printer memory by using only built-in printer fonts, check off Use Printer Fonts for All TrueType Fonts.

If you want to customize the printer fonts that match TrueType screen fonts, click on Edit Substitution Table, and match the TrueType fonts in the left column of the menu to PostScript fonts in the right column. If you want to use some but not all TrueType fonts instead of the corresponding built-in printer fonts, assign the names of those TrueType fonts in the left column to the right-column entry "Download as Soft Font."

This menu lets you select TrueType screen fonts to match printer fonts for which there is no ATM match—and lets you dispense with ATM entirely if you don't use Type 1 soft fonts. One disadvantage is that the on-screen metrics won't match the printed metrics exactly.

Using ATM's aliases and synonyms ATM.INI has two substitution tables. One is headed "[Aliases]." In the list underneath, a font to the right of the equal sign is the ATM font that ATM will display on-screen (and print to non-PostScript printers) when you select the non-ATM font on the left from an application's menu. This lets ATM substitute its fonts for the crude Windows vector fonts such as Modern and Roman.

The potentially more useful ATM substitution table is headed "[Synonyms]." If you have a Type 3 PostScript font with no matching screen fonts, you can use this section to tell ATM to display an ATM screen font of your choice when you use the Type 3 font. The font on the left of the equal sign is the ATM font; the one on the right is the non-ATM font.

► **Match the scalable fonts in the LaserJet III to Windows screen**

fonts The LaserJet III family contains two scalable Intellifont families, CG Times and Univers. When you select them, Windows automatically displays the TrueType fonts Times New Roman and Arial. If you want an exact match between the screen and printer fonts, you have two choices. You can call HP (303-353-7650) for a free copy of Intellifont-for-Windows 3.1, which comes with scalable Intellifont versions of the internal fonts, and lets you add other Intellifont fonts for the screen or printer. But a better choice is probably to buy TrueType versions of the two typeface families from Agfa. The TrueType will display on-screen, and the printer will use the internal fonts.

► **Use bitmap fonts for highest quality and speed** If you use the same font in the same size for almost all your documents, install bitmapped screen fonts for the fastest and highest-quality screen output. ATM or Windows won't have to create screen fonts every time you run Windows, and the quality is often better (never worse) than fonts created on the fly.

To create bitmapped screen fonts that match ATM Type 1 fonts, use the Font Foundry utility that comes with any Type 1 font from Adobe, Agfa, Linotype-Hell, or Monotype. Font Foundry automatically installs the bitmap font into Windows. You can use Font Foundry with any Type 1 fonts that come with .INF and .AFM files, but you may have to copy those files by hand from the floppy disk to the directories where Font Foundry will expect to find them—normally PSFONTS\AFM and PSFONTS\FONT-INFO. (See the tip "Installing Third-Party Type 1 Fonts in WordPerfect" for advice on creating .AFM and .INF files for fonts that don't come with them.) Make sure that "Use pre-built or resident fonts" is checked in ATM's control panel.

You can't create bitmap fonts directly from TrueType fonts, but you might consider converting a TrueType font to Type 1 format with FontMonger and using Font Foundry to generate bitmaps. The inevitable loss of quality during conversion may make this less than worthwhile.

SuperPrint lets you save bitmap screen fonts, but the quality is generally

lower than on-the-fly ATM and TrueType fonts.

► **Download in advance to speed printing** Windows normally downloads to the printer the soft fonts needed for every print job. You can speed printing by downloading bitmap or scalable fonts in a batch before you start Windows, or with a downloading utility that runs within Windows.

If you use a LaserJet or compatible, the printer driver can create a batch file that downloads your fonts and adds the batch file to AUTOEXEC.BAT. In Control Panel's printer menu, select your LaserJet printer, then choose Setup, Fonts. If your fonts are already installed, select one by one the fonts you want to download before running Windows and click on the Permanent radio button. When you exit, a dialog box will ask you if you want to download the fonts now or at startup; you can choose both. If you choose startup, the driver adds to AUTOEXEC.BAT a call to a batch file that downloads the fonts.

If you choose to install this batch file, Windows will remove the name of the soft font file from WIN.INI, and Windows will not download these fonts automatically each time you print. You can disable the batch file and make Windows download the fonts at print time by going back to the printer driver and marking the fonts as Temporary instead of Permanent.

If you use a PostScript printer, you can download fonts automatically by writing a batch file that calls one of two utilities that come with Adobe soft fonts: PCSEND (for printers connected to a parallel port) or PCDOWN (for a serial port). Refer to the Adobe soft font manual for details.

If you download fonts before running Windows, you'll have to modify WIN.INI by hand to prevent the fonts from being downloaded with each print job. Look under the heading "PostScript,LPT1" (or other port name), and find the line that identifies the downloaded font. It looks like this:

```
softfont1=c:\psfonts\pfm\
font____.pfm,c:\psfonts\font____.pfb
```

Remove the comma and everything after

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BEAVER

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2 Norina Tech. 486/33    4 MB 138 SUGA Norina $1895 GS
  Cannot beat the price. Cannot beat the components.
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4 Allur Tech. 486/33 8 MB 288 VGA Allur $2899 GST
5 Aitec Tech. 486/33 8 MB 210 SUGA Aitec $2395 GSTH
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Enter as many as 6 choices (<CR> for more) !

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it to prevent Windows from downloading the font.

Alternatively, you can use **WIN-DOWN**, the Windows downloader that comes with Adobe soft fonts. This allows you to create font packs for one-step downloading of multiple fonts, and it edits **WIN.INI** for you. You will have to run it each time you turn on your printer, so it may be convenient to add this utility to the Windows Startup program group. For other downloading utilities, see the following tip, "Thirteen utilities to manage fonts."

► **Thirteen utilities to manage fonts** Unless otherwise noted, you can find any of these utilities that are available as shareware or freeware in CompuServe's **DTPFORUM**, Library 6, under the filename listed in parentheses. Also see the sidebar "Converters: Almost True to Type."

CAFonts (CAFONT.ZIP) A DOS utility that checks whether you have all needed files for your Type 1 fonts and whether the font names are consistent among related files. (Free; Ivan Gonzalez; CompuServe ID 72540,433.)

FontMinder The indispensable utility for managing PostScript printer soft fonts; does everything ATM and the PostScript driver should do but can't. (\$79.95; Ares Software Corp.; Foster City, California; 800-783-2737.)

FontTabl (FNTTB3.COM) A DOS utility for printing character-set charts of PCL 4 bitmap fonts and PCL 5 scalable fonts. Available on CompuServe's **HPPERIPH** forum, Library 4. (Free; Rufus S. Hendon; CompuServe ID 73250,2674.)

PFBview (PFBVIE.ZIP) A Windows utility that displays Type 1 fonts even if they aren't installed in Windows. (Free; Martin Hepperle; CompuServe ID 72020,2665.)

PFMCnvt (PFMCVT.ZIP) A utility that updates Type 1 font metric files to include width and kerning data for characters newly available under Windows 3.1. (Free; Dennis Harrington; CompuServe ID 76216,3472.)

PFMEdit (PFMEDT.ZIP) A Windows utility for editing Type 1 font metric files. **PFMEdit** lets you change kerning data interactively, and change font names

for more rational menu displays. (Free; Dennis Harrington; CompuServe ID 76216,3472.)

Printer's Apprentice (PA.ZIP) The best-designed Windows font viewer for all font formats, with customizable printouts of character sets and keyboard layouts. Available on PC MagNet (Library 10) of the Utilities/Tips Forum. (\$20 shareware; Lose Your Mind Development, Bryan T. Kinkel; 506 Wilder Square, Norristown, PA 19401; CompuServe ID 70564,2372.) **Fonter** is a similar utility with slightly different features (FNTR50.ZIP; \$15; OsoSoft Shareware; CompuServe ID 71571,222).

RenameTT (RENTT2.ZIP) A utility for changing the names under which TrueType files appear in your font menus. (Free; Rufus Hendon; CompuServe ID 73250,2674.)

TInstall (TTI14.ZIP) A shareware installer for TrueType fonts that lets you preview fonts before installing and prints sample pages; send the author science fiction books if you like it. (Kai Kaltenbach; CompuServe ID 70640,514.)

Type Director 2.0 A DOS utility for creating and managing PCL 4 and PCL 5 fonts from Intellifont disks. Don't be put off by the terrible interface. (\$39.95; Agfa Division, Miles Inc.; Wilmington, Massachusetts; 800 424-8973; Version 2.5 is currently available from Hewlett-Packard Co. for \$49.95 and should be available from Agfa by the time you read this.)

WinPSX (WINPSX.ZIP) A Windows downloader for Type 1 fonts; also prints samples. One of the few utilities that displays font names and filenames on the same screen. **PSX.ZIP** is a DOS version. Both are available on PC MagNet (Library 10) of the Utilities/Tips Forum. (Free; Costas Kitsos; CompuServe ID 73667,1755.) A simpler downloader is **DownWind** (DW101.ZIP; \$10 shareware; Craig Harding; CompuServe ID 72010,1550).

Wrefont The simplest and best-designed utilities for creating metric files used with Type 1 fonts and for converting Type 1 or TrueType fonts between Macintosh and PC formats and encoding. It doesn't modify the outlines or hinting. Indispensable for working with Type 1 fonts from small foundries. (\$24; Acute Systems, P.O. Box 37, Algonquin, IL 60102; no phone number.)

Troubleshooting

►What fonts do you really have?

If you don't have a true bold or italic version of a typeface, Windows will still let you choose to make your text bold or italic. But the printed output won't be what you expect. Depending on the printer, you'll simply get an artificially darkened or slanted version of the ordinary font, or the ordinary font without any modifications at all.

The easiest way to see precisely which typeface weights you have is via Windows Write, which uses the Windows 3.1 standard font dialog box. This displays the typeface name, the available weights, and the available sizes. The only fonts that confuse it are bitmapped LaserJet soft fonts: The dialog box sometimes tells you that you have a bold font in a specific size when you only have a normal and italic. To be certain which LaserJet soft fonts you have, select your printer in Control Panel's Printer menu and select Setup, Fonts.

► **You select Garamond and you get Courier** Sooner or later you'll see the font you want on-screen, and Courier or nothing at all on the printed page. Follow these steps to solve the problem.

1. If you use a PostScript printer, check whether **WIN.INI** has your soft font marked for automatic downloading under the [PostScript,LPT1] or other port heading. If the line that names your fonts looks like

```
softfont1=c:\psfonts\font____.pfm
```

then Windows won't download the font at print time. Add a comma to the end of the line and then the pathname of the corresponding .PFB font file. Don't use a semicolon or other punctuation instead of a comma, and don't insert any spaces in the line.

2. If Windows is downloading your fonts, you may not have enough memory in your printer to hold them. Try printing a file with only one soft font, then two and more until your printer starts printing in Courier instead of the last font you load. The only solution to this problem is to add more memory to the printer.

3. If you use a LaserJet, and you get the

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Direct Access, on the other hand, gives you a multitude of utterly sensible program groupings—17 of them.

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Direct Access searches your hard disk, groups your applications logically and generates menus and submenus automatically. All you have to do is point and click.

mon a word processor by stroking "W." And access a DBMS by selecting, you guessed it, "Database."

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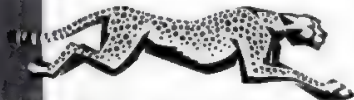
do is hit one key.

Or, if you prefer, click one mouse.

The more applications you have on your disk, the more you'll delight in Direct Access.

That's because Program Manager insists on grouping your programs into five arbitrary categories: "Windows Applications," "Non-Windows Applications," "Accessories," "Games" and "Main."

Not very intuitive, eh?



FIFTH GENERATION SYSTEMS, INC.

wrong font on printout, check the softfont= lines in your printer's WIN.INI entry. If only the .PFM file is listed, you need to add the path to the soft font file. It is safest to use Control Panel's Printer menu to do this. Select your printer; choose Setup, Fonts; and reinstall the problematic font.

► **Third-party TrueType fonts don't work correctly** Some characters in shareware and small-foundry TrueType fonts may not print at large sizes. You can usually fix this by adding to the [TrueType] section of WIN.INI:

OutlineThreshold=70

Start at 70, and increase the value until you encounter the problem again, then back off slightly. The number is the threshold at which Windows starts to render TrueType fonts as outlines rather than bitmaps. Don't set the value over 300; the default is 256.

► **You choose italic and you get bold or small caps** Many fonts produced by small Macintosh-oriented foundries don't have the correct information that lets Windows organize them into font families. In the worst case, you may end up with the normal version of the font listed on your font menu, but a small-caps version when you select the font—and no way to access the italic or bold versions at all. Alternatively, you may find the italic weight listed separately on the font menu, and no way to access the italic by choosing the Italic attribute with a keyboard shortcut in your applications. Often the font vendor won't know how to fix the problem.

You can solve the problem yourself by using the utility PFMEDIT to assign the proper font family names and attributes (see the tip "Thirteen utilities to manage fonts"). Following the instructions in the documentation that comes with the program, open the .PFM files for each font, give the italic and bold variants the same

family name as the normal font, and assign the italic and bold attributes. Give a different family name to variants with small caps and similar features. Then reinstall the fonts with Adobe Type Manager.

► **You can't install a LaserJet font in Windows** Most PCL 4 and 5 fonts can be installed by the font installer built into Windows' LaserJet printer driver. If you have fonts that the installer won't recognize, use HP's Type Director, which can force Windows to work with almost any PCL soft font (see the tip "Thirteen utilities to manage fonts").

Power Tips

► **Finding unusual fonts** The thousands of typefaces you can get from the large foundries probably don't include all the fonts you need. Smaller foundries, often consisting of one designer, create some of today's most impressive and pop-

■ Fonts from Small Foundries

Some of the most novel and interesting type designs come from the smaller foundries in the Type 1 market. Here are some notable examples.

Clear Prairie Dawn *Italic* Spike Bold INCISED

Quadrat Communications

Koch Original Spumoni *Spring*

Letter-Perfect

Prospera II *Prospera Italic* SMALL CAPS I23

Alphabets Inc.

STRONGPRINT GRECO DECO

Lazy Dog Foundry

Radish SHAFT Elevator

Diehl Volk

LEONARDO HAND Tagliente 

Flourish

The Electric Typographer

varlex bold Triplex Bold Serif Bold
Matrix Inline Script Elektriz Bold

Emigre Library

XAVIER BLACK MEDIUM
METROPOLIS SHADED

Castle Systems

justLeftHand SMALL CAPS TYPEFACE 6
Trixie Plain Dolores Extra Bold

The FontFont Library



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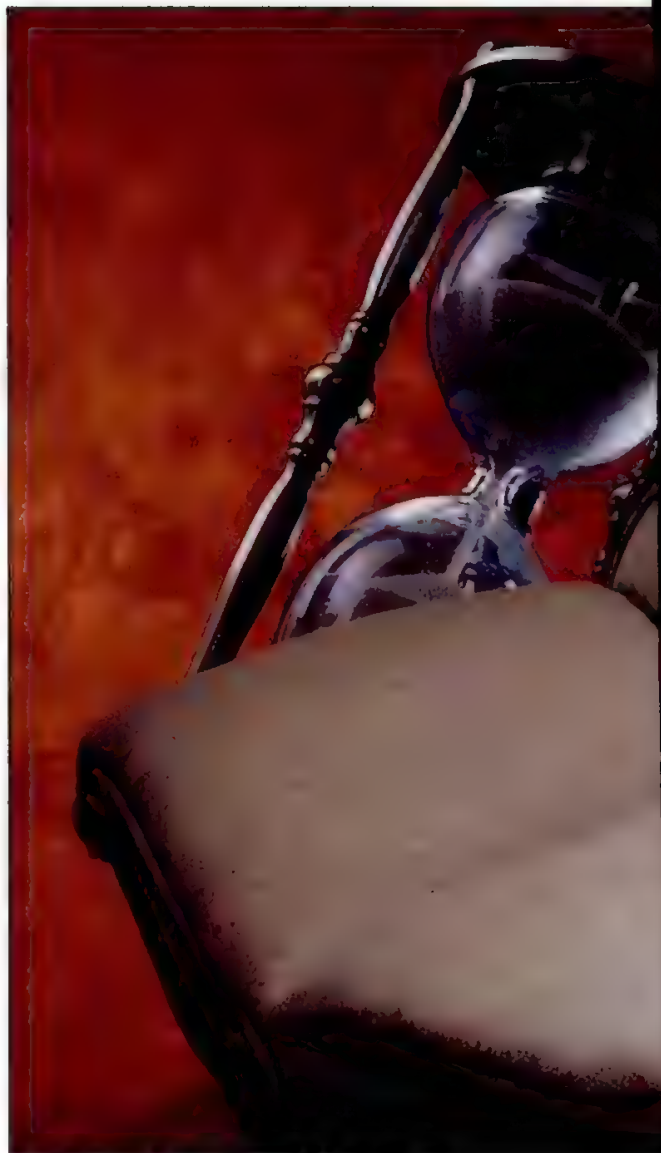
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The People's Choice.

ular typefaces. Almost all small foundries got their start in the Macintosh market; most now sell PC Type 1 or TrueType fonts as well. Here are some of the best.

The FontFont Library ranges from elegant text faces in classic styles to clever script and display faces, including one that looks like type from an old Underwood. Type 1 only, on-disk and CD-ROM (with the Monotype Library on the same CD-ROM). (\$105 to \$185 per package; FontShop America; Toronto, Ontario, Canada; 800-363-6687.)

Emigre's designs include fashionable and amusing display faces that you have probably seen everywhere. The Variex and Triplex families are wildly popular. TrueType and Type 1 available. (\$65 to \$125 per family; Emigre; Sacramento, California; 800-944-9021.)

The Electric Typographer specializes in script faces, including one based on Leonardo da Vinci's mirror-image handwriting, and other personal designs. Type 1 only. (\$45 to \$79.95 per family; The Electric Typographer; Santa Barbara, California; 805-966-7563.)

Letter-Perfect offers a mixture of strong scripts, playful scripts, and revivals of early-twentieth-century designs. The scripts include expert sets with alternate characters. Type 1 or TrueType. (\$65 to \$175 per family; Letter-Perfect; Gig Harbor, Washington; 206-851-5158.)

Alphabets Inc. has a small group of well-drawn text, calligraphic, and nineteenth-century wood-type designs, with Multiple Master faces due later this year. Type 1 or TrueType. (\$74.95 to \$134.95 per family; Alphabets Inc.; Evanston, Illinois; 800-326-4083.)

Castle Systems offers striking display faces, including revivals of rare early-twentieth-century designs. Type 1 or TrueType. (\$79 for one font; \$30 for each additional font; Castle Systems; San Rafael, California; 415-459-6495.)

Quadrat Communications has three cleanly designed text and display faces. Type 1 or TrueType. (\$60 to \$120 per family; Quadrat Communications; Toronto, Ontario, Canada; 416-960-0606.)

Lazy Dog Foundry specializes in well-drawn, bargain-priced versions of typefaces from the 1920s and 1930s, and a collection of miscellaneous script faces. The company will convert your handwriting to a font for \$199. Type 1 or TrueType.

(\$99 for ten faces from the 1920s and 1930s; \$69.99 to \$179 for handwriting faces; Lazy Dog Foundry; St. Paul, Minnesota; 800-876-9807.)

Diehl.Volk offers stylish display faces, including the face used in the title of the film *Shaft*. Type 1 only. (\$25 to \$150 per family; Diehl.Volk Typographics; Los Angeles, California; fax, 213-851-7031.)

Lanston Type Co. has about 30 fami-

One of the best sources of unusual and display faces is the DTPFORUM on CompuServe, where you can find hundreds of free and shareware fonts.

lies of beautifully drawn hot-metal designs with many elegant typographic features. They tend to be too light for 300-dot-per-inch printing, and romans and italics are not combined on font menus. Some faces need revision to work properly under Windows, but this collection is worth your effort. The decorative initials are the best available. Type 1 only. (\$35 to \$360 per family; Lanston Type Co.; Vancouver, British Columbia, Canada; 800-663-8760.)

Photo-Lettering offers famous display faces by Ed Benguiat at about a dollar a face. Type 1 or TrueType. (\$14.95 for 13 fonts; Photo-Lettering Inc.; Evanston, Illinois; 708-328-7380.)

Digital Typeface Corp. has three low-priced volumes of 100 faces, mostly licensed from the German URW foundry, including a beautifully drawn set of vine-leaf ornaments. Type 1 only (TrueType around the end of 1992). (\$295 per 100-font volume; Digital Typeface Corp.; Eden Prairie, Minnesota; 612-944-9330.)

RoadRunner Computing has the best—because it has the simplest—keycap fonts on the market. Type 1, TrueType, or PCL 4 bitmaps. (\$54; RoadRunner Computing; Baton Rouge, Louisiana; CompuServe ID 76436,2426.)

The Font Company offers 1,600 generally well-drawn text and display faces, including multiple versions of the same

design. Some of the classic designs are unavailable elsewhere. Type 1 only. (\$49.95 for one; \$37.50 for five or more; The Font Company; Scottsdale, Arizona; 800-442-3668.)

CastCraft's OptiFonts are digitized versions of an enormous library of metal faces, all available on special order; 400 fonts in both TrueType and Type 1 format are on a single CD-ROM. (\$996 for CD-ROM; CastCraft Software Inc.; Skokie, Illinois; 708-675-6530.)

One of the best sources of unusual and display faces is **CompuServe's DTPFORUM** (Library 9), which has hundreds of free and shareware fonts. Many, especially the designs by David Rakowski, approach professional quality.

►**Beyond the Latin alphabet** Non-Latin alphabets used to be almost impossible to find on high-quality PC fonts. Now you can find almost any major alphabet in well-drawn Type 1 and TrueType faces. Effective use of non-roman faces requires a keyboard remapper. Adobe ships one with its Minion Cyrillic typeface; another comes with Data-Cal's WorldFont for Windows. For international phonetic alphabet fonts, try Adobe's Stone Phonetic or Times Phonetic. Both require applications that support automatic kerning if you want to use diacritical marks. You can find shareware phonetic fonts on DTPFORUM.

WorldFont for Windows includes Arabic, Armenian, Cyrillic, Greek, Hebrew, Japanese Katakana, and Thai alphabets, and Latin fonts for transliterated Sanskrit and eastern European languages. Type 1 and TrueType included. (\$249; Data-Cal Corp., Chandler, Arizona; 800-223-0123.)

Casady & Greene sells Cyrillic versions of Bodoni, Garamond, and other faces in its Glasnost Cyrillic Library. Type 1 and TrueType in one package. (\$200; Casady & Greene Inc.; Salinas, California; 800-359-4920.)

Architext has Cyrillic and Katakana faces in Type 1 and TrueType. Bar code and custom text fonts are also available by order in any format. (Prices on request; Architext Inc.; San Antonio, Texas; 512-490-2240.)

WinGreek is a shareware Windows package for Greek and Hebrew scholarship, with Type 1 and TrueType fonts and

a utility for right-to-left text entry. (\$35; WinGreek; Scarborough, Ontario, Canada; Internet address peter@artsci.utoronto.ca.)

Kabbalah Software offers high-quality Hebrew fonts and utilities for right-to-left text entry. Type 1 and TrueType. (\$35 to \$49 per family; Kabbalah Software; Edison, New Jersey; 908-572-0891.)

Eastern Language Systems has two sets of exceptionally well-drawn Arabic Type 1 fonts, designed mostly for use with its Al-Kataab Windows word processor. (\$99 for 6 fonts; Eastern Language Systems; Provo, Utah; 801-377-4558.)

► **Using Macintosh Type 1 fonts on the PC** If you have access to a Macintosh, one easy way to get the font to the PC is to copy it to a 1.44MB Macintosh disk, insert the disk in the PC, and copy the files to your hard disk with the Mac-in-DOS utility. (\$199; Windows version, \$249; Pacific Microelectronics; Mountain View, California; 415-948-6200.) Use Wrefont (see the tip "Thirteen utilities to manage fonts") to finish the conversion. If you want access to high-order characters, remember to use Wrefont's option that changes the encoding of the font from AppleStandard to Standard-Encoding.

Alternatively, on the Macintosh, copy fonts directly to a DOS disk by using Apple File Exchange, or simpler third-party file transfer software such as AccessPC (Insignia Solutions; Mountain View, California; 415-694-7600) or DOS Mounter (Dayna Communication; Salt Lake City, Utah; 801-531-0600). You'll probably find that the font file appears in a hidden directory called RESOURCE.FRK; simply use the Macintosh utility REFORK (widely available on CompuServe and BBSs) to copy the font's resource fork to the data fork of a file. Copy the file to a PC-formatted 1.44MB floppy disk using Apple File Exchange. On the PC, use Wrefont to complete the conversion. When Wrefont converts some Macintosh TrueType files, Windows refuses to accept the result. If this happens, import the Macintosh file in Ares Software's Font-Monger, and export it in Windows format; you'll lose the original hinting, however. Wrefont, which doesn't change the original hinting, may have fixed this problem by the time you read this.

► **Get hassle-free printing from your service bureau** First, find a service bureau that doesn't grumble when you bring in a PC disk. Most service bureaus are Mac-oriented; you will invariably save time and money by searching for one that understands the PC.

Second, find out if your service bureau

*If you use TrueType fonts,
make sure the service
bureau has up-to-date
printer drivers, copies of
the fonts you use, and
experience with TrueType.*

uses exactly the same fonts you use. If you have Monotype's version of Bembo, and the service bureau uses Adobe's, you may end up with an expensive page of Courier. Never use a utility that changes the names of your fonts.

If you're not sure the service bureau uses the same fonts as you do, don't bring in the file with the document, but print the document to a file and bring it to the bureau. Make sure the fonts have been marked for automatic downloading in WIN.INI—that is, the line that identifies them in WIN.INI contains the full paths of both the .PFB and .PFM files. Your soft fonts will be incorporated in the file, and should print perfectly. But printing will take longer and cost more than if you use the document file itself.

If you use TrueType fonts, make sure the service bureau has up-to-date printer drivers, copies of the fonts you use, and experience with TrueType. But it still may be safer—although more expensive—to print the document to a file.

► **Printing IBM graphic characters with TrueType or Type 1 fonts** Under Windows, you'll need fonts designed with the IBM character set. You can use the Lotus Line Draw TrueType font that ships with Ami Pro 3.0; double lines may print slightly out of alignment. For a font that reproduces the exact shape of the IBM VGA font, download E. A. Behl's \$5 shareware TrueType

VID-TT.ZIP or Type 1 VIDEO.ZIP fonts from CompuServe's DTPFORUM, Library 9. Both work best at 12 points.

To copy an IBM screen with graphics characters to a Windows application, use this tip from Gerry Kowarsky. Open the DOS application full screen. Press Print Screen to copy it to the Clipboard. Open the Clipboard, and under the Display menu, select OEM Text. Save the clipboard as a .CLP file. In your word processing program, choose a font that uses the IBM character set, make the page margins as wide as possible, and import the .CLP file. Delete the mostly unreadable text at the top and bottom. The remainder is an image of the IBM screen.

Three Adobe fonts include the full-line IBM character sets: Letter Gothic, Prestige Elite, and Orator. The only software that is able to use the IBM characters in these fonts is WordPerfect, which reprograms them on the fly to act as two fonts, one with the standard PostScript character set, the other with the IBM character set.

► **Use WordPerfect's automatic ligature substitution** WordPerfect is the only PC software that can automatically replace letter pairs like "fi" and "fl" with *ligatures*—single characters that contain both letters linked together for superior appearance. You turn on this feature on the menu you arrive at after choosing Format, Other, Printer Functions. You won't see the effect in the editing screen, but it shows up in Print Preview and on the printed page. For the feature to work at all, the font used by your text must include the ligatures; WordPerfect won't try to find them in any other font.

This feature is undocumented, perhaps because it works inconsistently with most font formats. The best metal typography used five ligatures: fi, fl, ff, ffi, and ffl. WordPerfect tries to use them all when it encounters those sets of letters, but if it doesn't find a matching ligature in your font, it prints the three letters separately. This causes problems with a phrase such as "office file," because standard Type 1 fonts contain only the "fi" and "fl" ligatures. WordPerfect fails to find an "ffi" ligature in "office" and so prints all the letters separately; it doesn't try to print "f" followed by the

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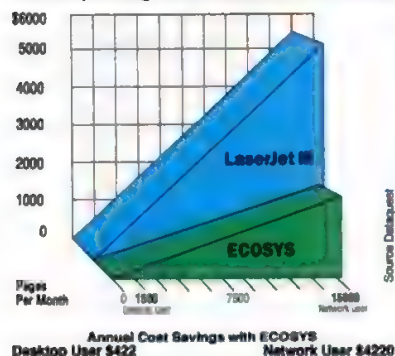
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GRAPHICS

Fonts

“fi” ligature. But with “file,” it prints the “fi” ligature.

Expert set Type 1 fonts from Adobe, Linotype-Hell, and Monotype contain all five ligatures, but you'll have to insert the “ff,” “ffi,” and “ffl” ligatures manually. You can generate Intellifont fonts with Type Director or Intellifont for Windows that contain all five ligatures if you choose the Microsoft Publishing symbol set, but these fonts won't contain the rest of the alphabet, so you'll have to insert the ligatures manually.

Intellifont typefaces used with Fonts-on-the-Fly, however, contain all five ligatures and print automatically from WordPerfect. Speedo typefaces also contain all five ligatures, and print correctly when used with FaceLift for WordPerfect. TrueType fonts normally have no ligatures, although some fonts from small foundries contain them in place of the usual high-order characters.

►Improve output with old-style numerals and true small capitals

For the best-looking output, use fonts with specially designed small capitals when printing words that consist entirely of capitals. Don't use the reduced version of the ordinary capitals that you get when you choose Small Caps as a text attribute in a word processing or DTP program. True small caps are more widely spaced and differently proportioned from reduced capitals. Most fonts with true small capitals also contain old-style numerals with ascenders and descenders, which are easier to read than the “lining numerals” used in standard digital fonts.

You can find small caps and old-style numerals in expert set Type 1 fonts from Adobe and Monotype, and in similar old-style numeral and small-caps fonts from Linotype-Hell (which are also sold by Adobe). The TrueType specification doesn't explicitly support old-style numerals and small capitals, and the only TrueType fonts that include such characters are a very few from Monotype and some small foundries.

►Create font sets using WIN.INI

If you have more than a few dozen Type 1 fonts installed for your PostScript printer, you may want to divide the fonts into separate entries in WIN.INI, so that only the fonts you need



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GRAPHICS

Fonts

for individual jobs appear on an application's font menu. In order to do this, your printer needs to be connected to a parallel port such as LPT1. First, in the [Ports] section of WIN.INI, add a line that looks like this:

```
LPT1.LET=
```

The extension LET tells you that the fonts installed for this port are the ones you use for letters. You can use any abbreviation you want, and you can create multiple lines of the same kind.

Now from Control Panel's Printer menu, notice that your printer is already installed and listed as connected to LPT1. Use the Add button to install the same printer again. Use the Connect menu to assign the newly added printer to LPT1.LET. Now edit WIN.INI again, where you'll find the heading [PostScript,LPT1.LET] and a line underneath that reads "ATM=placeholder." Go to the heading [PostScript,LPT1], copy only the lines that list the fonts you want to use with your new printer entry, and paste them under the [PostScript,LPT1.LET] entry. Renumber them, starting with 1, and add a line that reads "softfonts=#" where # is the number of fonts you've copied. When you restart Windows, make the printer connected to LPT1.LET your default printer, and only the soft fonts you have chosen for it will appear in your font menus.

►Installing third-party Type 1 fonts in WordPerfect The installer that you get with Type 1 soft fonts from Adobe, Agfa, Linotype-Hell, and Monotype can install those vendors' fonts in WordPerfect. It can also install other vendors' fonts if they come with the .AFM and .INF files that the installer needs. Many third-party fonts don't have one or both of these files, but you can create them quickly with Acorn Software's Wrefont (for more information, see "Thirteen utilities to manage fonts").

If your Type 1 font comes with an .AFM file, Wrefont will generate an .INF file. If the font lacks an .AFM, Wrefont can generate one from the .PFB and .PFM files. You can also use Ares Software's FontMonger to generate these files. Import the Type 1 font into FontMonger, then export it as a Type 1 font,

and you'll get the metric files; discard the exported font, but keep the metric files you don't already have.

If you want to use Adobe's Font Foundry to generate fonts, use a maximum of five letters in the filenames for each file, followed by enough underscore characters to create an eight-character name, such as PCMAG__.*

Installing the Type 1 font itself in WordPerfect is a bit trickier. First copy the INSTALL.CFG file from any Adobe font disk to another disk. Open this file in a text editor, and notice the lines that begin "FONT." Replace the font names and five-character filenames in the Adobe file with the names of your fonts. Copy the .PFB, .AFM, and .INF files to the new disk, and use the Adobe installer to install the font.

►Alphabetize Ventura font lists If you add soft fonts to built-in printer fonts, Ventura Publisher's font menu won't list them in alphabetical order. David Satz's free SORTWD.EXE utility (available in CompuServe's VENTURA Forum, Library 4) fixes the problem in both GEM and Windows versions of Ventura.

►Use TrueType and ATM fonts with WordPerfect for Windows' own printer drivers WordPerfect for Windows normally uses ATM, TrueType, and other scalable screen fonts only when you use the Windows printer drivers. You can use these fonts on-screen and the printer with the more flexible WordPerfect drivers by using LaserTools Corp.'s PrimeType, which lets you use ATM fonts with any printer with both WordPerfect for DOS and WordPerfect for Windows.

MicroLogic Software's MoreFonts lets you use TrueType, ATM, or FaceLift's Speedo fonts with any printer. MoreFonts comes with its own scalable typefaces in a proprietary format, but you don't have to use them when you run MoreFonts as a way of adding scalable font support to WordPerfect printer drivers. MoreFonts installs these Windows scalable fonts into WordPerfect's drivers, but you won't be able to use the fonts under DOS. □

EDWARD MENDELSON IS A CONTRIBUTING EDITOR TO PC MAGAZINE.

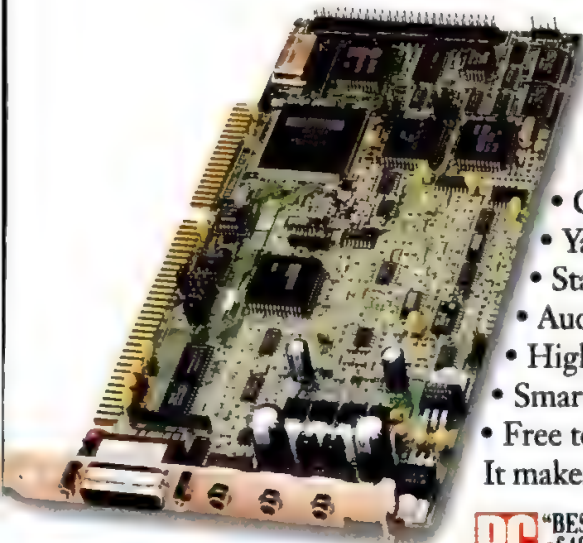


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- FastLynx
- Memory Expandable
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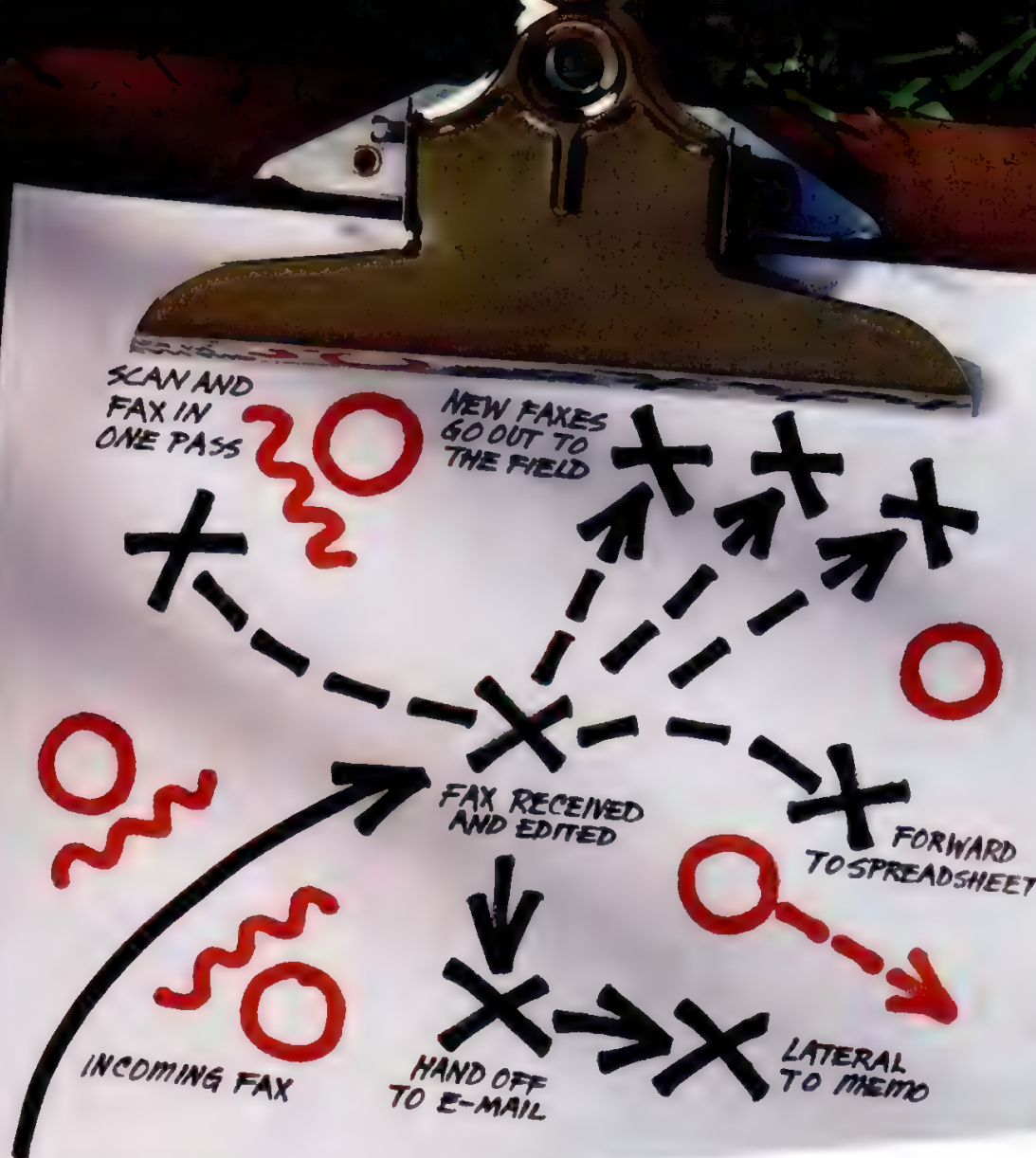
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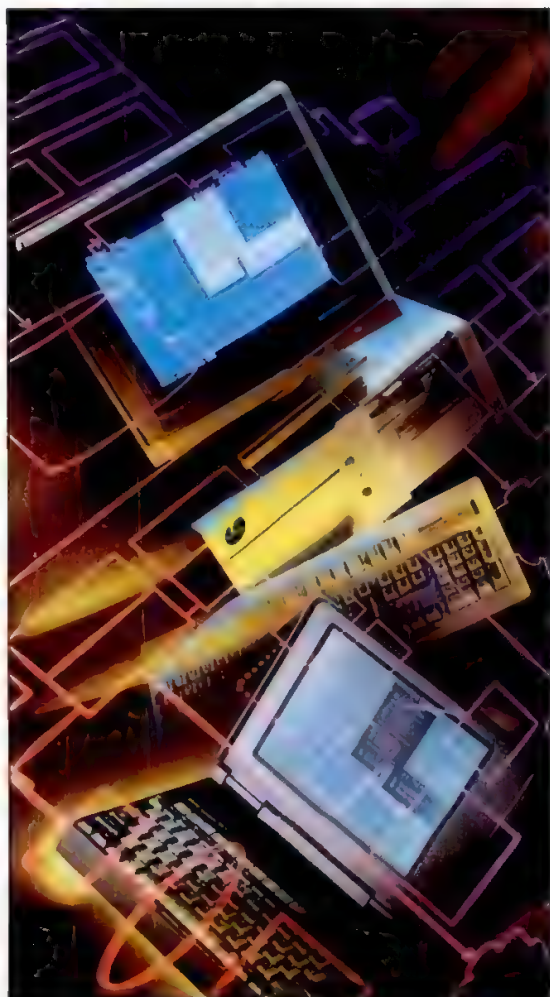
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E-MAIL SYSTEMS

Can They Keep Their Customers Satisfied?

From the system administrator's office to the users' desktops, messaging systems have promises to keep.



It won't be easy. To live up to their promise, LAN-based e-mail products—systems that let LAN users send and receive electronic messages—must gain acceptance from two groups that rarely see anything eye to eye: end users and system administrators. Walk into any organization and ask about what kind of e-mail system to buy and you're likely to find users and administrators in a face-off, waving their individual agendas.

End users have straightforward needs. They want a quick and easy way of exchanging messages and files with colleagues. From their desktops, they want to store and organize those messages in folders or compressed archives. And, once the messages are stored, they need to be able to search and retrieve quickly the information they need for that Monday morning meeting. Finally, they don't want to devote entire workdays to becoming proficient at managing their mail.

By contrast, system administrators, the people who sit behind the glass door and make the mail system work, favor packages that are easy to in-

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by Rick Ayre, Robin Raskin, and Ted Stevenson

stall, configure, maintain, and manage. What administrators think is important—efficient use of disk storage, providing a reasonable level of security, and managing connections to other e-mail systems—is usually of little interest to end users as long as the system works smoothly.

In this roundup of e-mail packages, we've looked at the issue from both perspectives, assigning two reviewers to look at each package. One approached it from an end user's point of view, performing a series of tasks "from the desktop," while the other concentrated on installing, maintaining, and optimizing the system to gather the perspective an administrator would have from "behind the glass door."

The products reviewed here all run on Intel-based PC mail servers across Novell's NetWare, Version 3.11. They offer interfaces to both DOS and Windows users, support at least an MHS (Message Handling Service) gateway, and offer re-

mote users access to the company e-mail system via a dial-up program that can be installed at a distant site. The products we reviewed here include Beyond's BeyondMail for DOS and BeyondMail for Windows, Lotus Development Corp.'s cc:Mail for DOS and cc:Mail for Windows, DaVinci Systems Corp.'s DaVinci eMAIL for DOS and DaVinci eMAIL for Windows, Futurus Corp.'s Futurus Team DOS/Windows Combo, Microsoft Corp.'s Microsoft Mail for PC Networks, Network Corp.'s Network Windows/DOS Combo, and WordPerfect Corp.'s WordPerfect Office.

All of these products have mastered the basics of messaging. But in the battle for the hearts and minds of both system administrators and end users, none were universally embraced by both. The engine that drives an e-mail system must have two basic components: a specialized database to store and forward messages and a

mechanism to route the messages to the appropriate address on the network. Each e-mail message is actually a record in the message database; its address, message content, subject line, and other elements are fields in that record. In practice, the database often stores only the message headers along with pointers to the message text, which is stored like a database memo field in an external file.

BEHIND THE GLASS DOOR

Acting as a sort of postmaster general, the administrator manages the database and creates and maintains a global address directory that lists the e-mail addresses of everyone on the system. The administrator also creates and manages the user profiles, which are records that include such information as where each user's individual post office is located and how much disk-storage space is allocated to each user.

The routing mechanism transports the mail. It can be a proprietary system built into a specific e-mail product or a modular one like MHS that piggybacks onto the network operating system. There are advantages and disadvantages to both.

BeyondMail and DaVinci eMAIL are examples of programs that have no transport mechanism of their own; they rely exclusively on MHS for message routing. For the administrator, the inconvenience of installing Novell's MHS on the network is offset by convenient features such as the ability to encrypt messages during transport. The more complex the e-mail system, the bigger the convenience dividends in using MHS. For example, MHS-based systems can read the MHS directory to create a post office address book in a seamless, transparent manner. cc:Mail, which uses a proprietary transport system, is the first non-MHS system to read the NetWare Bindery, the operating system's own database of users, and enter that information into its own directory. This spares the administrator from doing it.

But when you depend on MHS, you can offer only those features that MHS supports. Microsoft Mail 3.0's sophisticated transport layer can include more complex file types in messages; this frees the user from having to use binary attachments if, for instance, they would like to include a worksheet with the message. As

Suitability to Task: E-Mail Systems

These Suitability to Task ratings are meant to communicate a broad range of features that encompass the perspective of both the end user and the administrator.

All of the products we reviewed offer DOS and Microsoft Windows client programs. Because the DOS and Windows interfaces are different, and because vendors have not always synchronized their DOS and Windows releases, the two clients may have different features. We rated only one edition, the one with the richest feature set. DaVinci eMAIL was rated on the basis of the DOS client program, Version 2.01, instead of the older Version 1.8a of the Windows edition. In all other cases, since the two releases were synchronized, we rated the Windows client program.

From the end user perspective we rated basic messaging, file management, and interprocess communications. From the administrator perspective we rated mail server installation, client installation, and maintenance.

Basic messaging rates the ease with which a package allows a user to create, edit, send, and

SUITABILITY TO TASK				
Product Name				
	POOR	FAIR	GOOD	EXCELLENT
Basic messaging				
File management				
Interprocess communications				
Mail server installation				
Client installation				
Maintenance	N/A			

N/A—Not applicable. The product does not perform this task.

receive messages. **File management** extends the basic features into areas such as message management, folders, and message archiving.

While it sounds daunting, **interprocess communications** simply rates how well the e-mail client works with the rest of a user's applications; it considers features like launching attached files, clipboards, and DDE (Dynamic Data Exchange) support.

Mail server installation rates how easily a product can be installed and configured by an administrator. **Client installation** evaluates the ease with which a product's DOS and Windows clients can be installed and the clients can be synchronized with the servers. **Maintenance** assesses how well a product handles the tasks of maintaining user address books and message logs, preparing various usage reports, and pruning the base of stored messages.



▶ EDITORS' CHOICE

● Microsoft Mail for PC Networks

graphics, sound, and even video become an integral part of e-mail communications, Microsoft Mail will have a jump on the competition; users will be able to launch applications and view the files from within their messages.

QUOTIDIAN TASKS

Of all the day-to-day jobs that a system administrator must perform, deleting old messages to free storage space is one of the most essential and tedious. Any help the software can provide is a boon. BeyondMail assists with a macro that warns both administrator and end user when the latter's mailbox is full, and cc:Mail features a Reclaim utility an administrator can run to consolidate message-storing space in the same way that a disk optimizer defragments files.

Another major administrator's task, although it only occurs during setup, is creating the global address book for the system. Any automated way of doing it—such as importing user data from the NetWare Bindery or another external database—is a big plus. More than half of the packages we reviewed feature some sort of utility to migrate the data from the NetWare Bindery. But perhaps most important in the ongoing maintenance of the system is the administrator's ability to back up the mail system and repair the message database when its integrity is violated.

THE E-MAIL UNIVERSE

Privacy is always a concern in a shared environment and this is especially true of e-mail. Most e-mail systems offer at least rudimentary password-based security, but this rarely protects messages from the eyes of those who have supervisory rights to the system. Microsoft Mail encrypts messages and, when run under Microsoft LAN Manager, also hides the data files. WordPerfect Office allows users to encrypt files by assigning messages one of five levels of privacy—from "normal" to "for your eyes only."

Single products running on single LANs often grow to encompass linked servers, other e-mail systems, and communications with remote sites. As the e-mail universe expands, connectivity increases but administrative problems multiply.

If the present is the moment in time that separates the past from the future, then LAN-based e-mail's present is clearly embodied in our editors' choice, Microsoft Mail for PC Networks, Version 3.0. It has what organizations need in an e-mail package today. Its

simplicity will appeal to both end users and system administrators. With its deft graphical interface for Macintosh, OS/2, and Windows clients, it is easy to use and offers drag-and-drop features for mail management as well as message creation. And users will appreciate its ability to launch Windows applications to view attached files. System administrators will like the simple pull-down menus and context-sensitive help. And thanks to such features as automatic directory synchronization, even an experienced end user can handle administration. This puts Microsoft Mail in a class by itself.

One of its elegant subtleties can be seen in Schedule+, the scheduling module that was bundled with Microsoft Mail at the time of this review. Schedule+ is not just a useful add-on. It is an example of an architectural concept that is fundamental to the product: the use of an application programming interface (in this case Microsoft Corp.'s own MAPI) to add functionality to the messaging system. Through MAPI (Messaging Application Programming Interface), Microsoft has created a super application in its e-mail product, one which third-party developers can enhance modularly. Interoperability with other applications via DDE (Dynamic Data Exchange) and OLE (Object Linking and Embedding) turns Microsoft Mail into a true multipurpose tool.

To either side of Microsoft Mail stand cc:Mail, which in its present incarnation is a powerful representative of the past, and BeyondMail as a promise for the future. For that, they deserve honorable mentions.

cc:Mail is undeniably a robust and powerful product. But it showed its age in Version 4.0, which we tested. This is more apparent for the system administrator than the end user. You can build big, complex, wide-area mail systems with cc:Mail, but they are complicated and difficult to administer. Technical support and price are other areas in which cc:Mail failed to measure up. We look forward to future versions and a delivery on the promises of the VIM (Vendor Independent Messaging) API that Lotus Development Corp. and others are developing.

BeyondMail suggests in its very name the direction that e-mail is taking; that is, it's becoming more than just e-mail. To the general advantages of the Windows environment and interface, BeyondMail adds forms and what Beyond calls Rules. Electronic forms are not new, nor is the idea of routing them via e-mail. But BeyondMail is the first package to bring this capability to the PC platform.

More significant is the impact of *rules*, the current buzzword for easy-to-use programming that automates handling, routing, and organization of the increasing flood of electronically transported mail. Using a simple pick-list interface, end users and administrators can automate tasks. They can be as simple as diverting mail to a colleague when the user is out of the office or as complex as triggering an application that logs on to a dial-up service and downloads the latest stock quotes. Once BeyondMail is better equipped to handle the complexities of wide-area networking, it should be a true heavyweight contender.

Most systems allow several file servers to be linked together into one large mail system. This complicates addressing. Multiple servers require more precise naming schemes than the two-part scheme many systems used early on to route the mail. In that, the address contained a user's name and the name of the post office or server. Most of the systems we reviewed use a three-part scheme that allows a single local network to have several post offices. In these instances, directory propagation, where new users are automatically added to attached post offices, is a desirable feature.

But the complexities grow. In many corporations today, different workgroups choose their own e-mail products without regard to what other groups are using. This poses no problem until the different groups need to communicate. The problem is reminiscent of the days when various departments chose different word processors and then found they could not read the incompatible formats when they wanted to share documents. In the case of e-mail, the standard solution is a dedicated translator called a gateway. Most gateways are system-specific; that is, they link two specific e-mail systems, such as cc:Mail and WordPerfect Office. When more than two or three systems are being connected, setting up the links can become an administrator's nightmare.

MHS can ease communications difficulties among incompatible e-mail systems because it serves as a common intermediary language. Developed by Action Technology and subsequently bought and marketed by Novell, MHS is the oldest and most widely used e-mail standard we have. Any e-mail product that can talk to MHS, either as its own transport system or through an MHS gateway, can link to any other such system. But there are competing standards. Microsoft has implemented its Messaging Application Programming Interface (MAPI) in Microsoft

Mail and its Schedule + scheduler. And last year, Lotus announced its Open Messaging Interface (OMI), which this year evolved into the Vendor Independent Messaging (VIM) standard. Lotus is jointly developing VIM with Apple Computer, Borland International, and Novell. (See the sidebar "Mail-Enabled Applications Help Groups Work Together.")

THE DESKTOP PERSPECTIVE

The transport mechanism is at the back-end mail system. Each package we reviewed has at least four front ends: a DOS version, a TSR version to poll in the background and notify users of incoming messages, a Windows version with a graphical interface, and a remote dial-in version.

Ideally, these versions should all offer the same functionality. But that's not always the case. DaVinci's DOS version, for example, was one release ahead of its Windows version at the time of our review. It had more features, a situation DaVinci plans to correct. (See the sidebar "E-Mail Evolution: Works in Progress.")

All of the packages reviewed here are on an equal footing when it comes to basic addressing tasks. In each you'll find pick lists from which users can select addresses. All have speed search capabilities that will match a name in the database to the first few letters the user types. But the similarity ends there.

Some, like cc:Mail, allow both users and administrators to create personal address lists. Others allow only administrators to do this. Microsoft Mail offers Sent folders to log the messages you send, but few others do. Without a Sent folder, you

have to remember to copy yourself on every message or else you miss half the point of e-mail—keeping track of what you've sent to others.

CREATING MESSAGES

Creating e-mail messages should be as easy as writing letters in your favorite word processor. Cut-and-paste, search-and-replace, tabs, fonts, rulers, and all the other standbys of modern text processing ought to be available. And you ought to

be able to use your own word processor to compose an e-mail message. But except for WordPerfect Office, which is closely tied to WordPerfect itself, none of the packages have this option yet. The new DOS versions of cc:Mail and DaVinci eMAIL, however, do include conveniences such as

*Today's e-mail
packages need
considerable
refinement before
they'll become all
that they can be.*

spell-checkers.

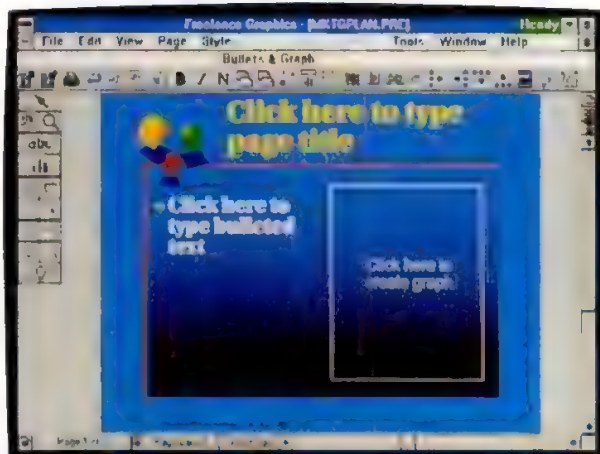
For now, if you want to send a graphic or an executable file, you're forced to attach binary files. A well-designed e-mail package should facilitate this with point-and-shoot attachment procedures that allow for multiple attachments. Futurus Team allows 64 attachments per message. The cc:Mail and Microsoft Mail front ends for Windows workstations, called Windows clients, do it one better with drag-and-drop attachments. All a user needs to do is click on a filename and drag it into their message. But attachments should become less of an issue in the future as more and more applications allow you to send rich compound documents that incorporate graphics, sound, and video.

INFORMATION OVERFLOW

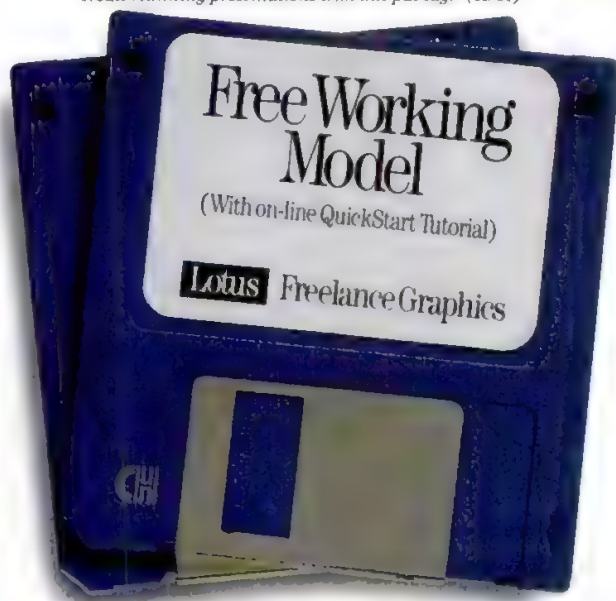
As the number of messages increases, storage space on the server diminishes and information becomes hard to find in the clutter. If end users fail to archive or delete their messages, the task falls to the administrator. An organized, systemwide approach to storing and archiving solves both problems. An e-mail package should allow users to store active message threads in folders and archive older, inactive messages on their local machines.

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Lotus Freelance Graphics for Windows

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Most of the reviewed packages let users create personal storage folders. Some allow users to nest folders as subtopics for more detailed message organization. DaVinci eMAIL, for example, allows up to 32 subfolders within a primary folder. But archiving information is only useful if it's easy to retrieve. And unfortunately, finding needed information remains difficult at best. The programs we reviewed let users search the To, From, Subject, Date,

and Priority fields. But it's tough to get at keywords in the content of the message. Microsoft Mail's message finder allows you to search text and provides the luxury of letting you conduct a global search; cc:Mail includes a search feature, but you can only search one folder at a time.

CROPING TOWARD GROUPWARE

Today's e-mail packages need considerable refinement before they'll become all

that they can be. But they provide a promising foundation for that shadowy futuristic concept called groupware. Groupware is evolving in the form of networked workgroup scheduling, document management, and shared databases, usually accompanied by a programming language or system of rules for managing and automating the way the components work together.

E-mail systems are already beginning

■ Mail-Enabled Applications Help Groups Work Together

by Rick Ayre

Are e-mail-enabled programs (eeps) just groupware taking shape? Since e-mail is the foundation of groupware, and eeps is a category poised to take off like a rush hour train, the answer may be right around the corner.

At the heart of any eep is the same client/server design that is just beginning to impact networked databases. But this time, the draw isn't network performance—it's about getting work done.

Eeps are applications that marry the functionality you need from, say, a word processor, to a networked message system like networked e-mail. The end result is the ability to use the message system from within the application.

WHAT IS IT TO BE ENABLED?

In eeps' simplest form, you might find a mail-enabled spreadsheet that, with a click of your mouse button on an envelope icon, will send your worksheet over the network to all of your team members.

A more complex form of eeps might be embodied in a calendar or scheduling program. Typically, you use a simple calendar to keep track of your appointments on your desktop computer. The difference here? This program is e-mail-enabled. So when you enter a new meeting, the program checks a network database for the availability of a vacant room, books it for your meeting, prompts you for a list of people you want to attend, notifies them via e-mail of your intention to hold the meeting, and provides you with a list of who will and won't attend.

That's just a taste of how eeps deliver the infrastructure for groupware. They make possible management applications that depend on time tracking. They enable workflow automation by allowing groups to share worksheets. They make possible document management, and even forms processing, using smart e-mail-enabled forms/databases.

But two problems loom. First, most of the applications people use are not yet e-mail-enabled. Second, if your organization is like most, you have more than one e-mail system—if you're lucky, no more than two or three.

But wait, the battle of the e-mail APIs (application programming interfaces) echoes the sound of the cavalry charging to the rescue. Why? First, these APIs split e-mail into its component parts: engine, user interface, message store, transport layer, and gateways. Second, e-mail APIs provide the tools developers need to create mail-enabled applications.

DUELING APIS

By late this fall developers will be able to choose from among no fewer than six e-mail APIs, at least three of which will matter to those who use PC-based networks. And some of the vendors touting e-mail APIs, specifically Lotus Development Corp. and Microsoft Corp., seem to be battling for the hearts and minds of developers.

Included in the fray is the Messaging Application Programming Interface (MAPI), from Microsoft. MAPI will be supported by Microsoft Mail 3.0, by Windows for Workgroup, and, when it

arrives, by Windows NT. If developers want an API that is tied to the Windows operating environment, then MAPI is the one API to choose.

Lotus has recruited Apple Computer, Borland International, IBM Corp., and Novell in support of their Vendor Independent Messaging (VIM) API. While Lotus claims its API is vendor independent, it strikes some as a way to ensure support for Lotus Notes. And, for all its platform independence, VIM offers a limited amount of functionality compared with MAPI. Critics also say it offers only a bare subset of the Notes or cc:Mail APIs.

Of less importance to PC-networked e-mail users is OCE (Open Collaboration Environment) from Apple. Some say it is the best of the e-mail APIs, encompassing multimedia events as well as more standard e-mail concerns. It will become part of System 7 soon and determining if it will impact PC users is difficult.

Then there are a slew of minor players, such as the X.400 API (XAPI) group, who are extending the X.400 messaging standard to cover things addressed by MAPI and VIM. They are considering several proposals, including one by Microsoft, to make MAPI the X.400 standard.

Only time will tell if there is a winner in the e-mail API shoot-out. But it seems likely that one API standard will grow to exert influence while others will be relegated to lesser roles.

TODAY'S MAIL-ENABLED APPLICATIONS

So, what does eep mean to you today? Well, there are few applications that

to take on a groupware look. Microsoft Mail, for example, is bundled with Microsoft's Schedule +, a group scheduling module that is fully integrated with the Windows e-mail client. cc:Mail, DaVinci eMAIL, and Futurus Team have their own schedulers, developed by third parties. WordPerfect Office 4.0 goes one step further and includes scheduling as an integral part of the package. Office pursues workgroup computing by allowing

come e-mail-enabled and only a few development systems that will allow workgroups to construct e-mail-enabled applications.

Lotus was the first vendor to promise to enable all of its applications. To date, Ami Pro is the only application with an e-mail connection built in, but Lotus 1-2-3 for Windows and Freelance Graphics will soon follow. As you can imagine, the Lotus applications work if you have cc:Mail. JustWrite was the first word processor, though, to come e-mail-enabled. All it requires is that an MHS (message handling service) transport be accessible.

Now, smart forms can also be network smart. PerFORM Pro from Delrina Technology can be used to develop forms that are used to route e-mail messages, and control the flow of information. In truth, on a purely functional level, they are more like pretty databases than the output of forms software.

Third parties are also empowering applications. Beyond's @Mail is a Lotus 1-2-3 add-in that turns the DOS versions of the venerable spreadsheet into a complete e-mail front end. You can create, send, receive, and manage e-mail without ever having to leave the comfort of the Backslash and all of the vistas (read menus) it opens.

WorkMAN from Reach and BeyondMail from Beyond are two powerful eep development systems. Both provide the tools you will need to develop e-mail-enabled forms, languages to control the flow of information, and complete messaging capabilities. These two products herald a whole new generation of e-mail functionality. □

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users to launch WordPerfect applications and other selected applications, including Microsoft Excel, from within the mail program. To do this, it uses a macro language with DDE (Dynamic Data Exchange) links to the applications. Approaching the problem the other way round, Futurus took Right Hand Man, its networked information manager with calendaring and scheduling, and built in an e-mail system to produce Futurus Team.

But the most ambitious package in the groupware arena may be BeyondMail with its BeyondRules language, which lets users and administrators create custom e-mail applications. If you're going on vacation and want all e-mail to be forwarded to your assistant, you can write a program using a few simple commands that will do the trick. BeyondMail also uses electronic forms, such as a "while-you-were-out" phone message form, for example, to let users quickly format and route common message types. Beyond also sells a forms designer tool that enables users to design more elaborate forms, such as expense reports. The forms generator, combined with BeyondRules, makes it possible to create a variety of scheduling, calendaring, and sophisticated message-routing systems.

WATER FAMILIAS

Lotus Notes, the mother of all groupware, encompasses the underlying database structures that allow for enterprisewide sharing of information. But from the outset Notes' e-mail capability has been notoriously lacking. Its features did not meet the filter for our review. As a harbinger of things to come, Lotus has recently announced its intention to fold the full functionality of cc:Mail into Notes. Should this come to pass, Notes may become the killer groupware application it was supposed to be from the first.

If and when this happens, it could give Lotus a head start over the competition in the integrated-groupware arena. But the battle over APIs (application programming interfaces) and the capabilities of the Windows environment with its DDE and OLE (Object Linking and Embedding) promise to put companies like Beyond, Microsoft, and others in the race as well. It should prove to be an interesting run for the money.

Beyond Inc.

BeyondMail for DOS

BeyondMail for Windows

**BY RON ANDERSON AND
SALLY BLANNING DEJEAN**

With the other e-mail packages currently on the market you have a tool. With BeyondMail, you have an ally. The program features a "Rules technology" that allows administrators and end users to customize message handling and automate information flow via e-mail. BeyondMail can be customized to work the way your office works; it can automatically move information according to parameters that managers set for a group or that end users set for themselves.

Beyond Inc.'s \$995 e-mail packages—BeyondMail for DOS, Version 1.1, and BeyondMail for Windows, Version 1.0—challenge a network administrator to become proficient in rules and forms development in addition to standard e-mail supervision. A programmer

or power user, working with a network administrator, can develop forms and house rules to govern the communications of all users in a given group. BeyondMail's end-user programming language, BeyondRules, allows users to automate the handling of information using plain English if-then statements that respond to defined events.

FROM THE DESKTOP

If you want an e-mail package that can handle day-to-day corporate communications, can manage messages, memos, and forms, and can work the way you want it to work, BeyondMail fits the bill with grace and elegance. The two manuals, a User's Guide and a Rule Book, are well written and offer plenty of helpful examples. The DOS interface resembles Windows: It supports a mouse and makes use of radio buttons, check boxes, and combo boxes.

Mail is forms-based. Messages are cre-

ated by filling in the blanks in the forms. Memo, Phone Message, Request Form, Meeting, and Transmittal Memo forms are included. An add-on product, the BeyondMail Forms Designer, enables you to create additional forms as needed. The Forms Designer is a Windows program written in Visual Basic and consequently suffers a bit in the speed department, but its graphical user interface makes creating forms a snap.

Rather than making you change the way that you work, BeyondMail can be customized to work with you using BeyondRules, its end-user programming language. Rules are based on the generic formula: WHEN a defined event occurs, IF it meets defined criteria, THEN perform these actions. Once you can express a rule in English according to this formula (for example, WHEN new mail arrives, IF it is from Keith or Clare, THEN move the

mail to the urgent folder and notify me), creating a new Rule is easy.

Each chapter in the User's Guide integrates a section on Rules. On-line help is context-sensitive and is complete enough that, with a little experience, users

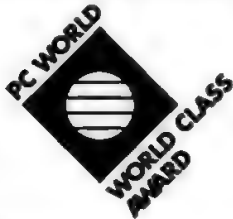
can probably dispense with the manuals altogether. Rules creation is similar to message creation. The user is presented with a new Rules form and fills in the blanks using combo boxes, drop-down lists, and menu selections for functions and actions. The Rule Book includes extensive information on the Rules language.

Folders to store messages can be created on the fly as needed. A menu selection enables you to "tickle" a message to deal with it at a later date. Tickling a message moves it to the tickler folder, where it waits until the date and time you choose. The user selects actions to be performed at that specified time, and at the appointed time BeyondMail executes those actions. Programming a tickle action is the same as programming any other Rule in BeyondRules. Such extensive consistency between the various components of BeyondMail helps to reduce your learning curve. Once you've

SUITABILITY TO TASK				
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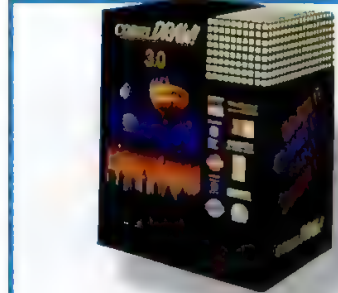
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2618	CorelDRAW! 3.0 (CD-ROM only)..... 369.

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2909	■ Crosstalk Mk 4 2.0..... 139.
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6585	□ FrameMaker for Windows 589.
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9832	■ SpinRite II 2.0..... 64.
Hayes	
7983	■ Smartcom EXEC 2.1..... 75.
Hellix Software	
9627	■ Netroom 2.1..... 52.
Hewlett-Packard	
8731	■ Dashboard 1.0 for Windows 59.
8101	■ NewWave 4.0..... 109.
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2666	■ DOS 5.0 Upgrade 59.
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2982	☐ WillMaker 4.0 39.
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8288	☐ DR DOS 6.0 67.
4000	☐ Netware Lite 1.0 69.
Panacea	
2413	☐ WinSpeed 1.0 (Windows accelerator) . 55.

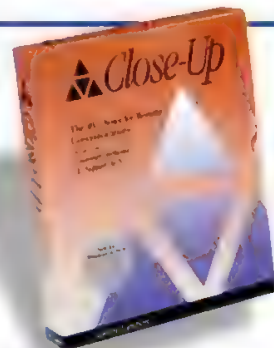
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3804 ☐ WordPerfect 5.1	269.
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8328 ☐ XTree 1.0 for Windows	39.
6161 ☒ XTree Gold 2.5	95.

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8351 ☐ Heaven and Earth	29.
Broderbund ... CP	
3340 ☒ Kid Pix	35.
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4411 ☒ SimEarth for Windows from Maxis	45.
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4183 ☒ KidWorks	29.
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8591 ☐ Quest for Glory III	39.
5150 ☐ Aces of the Pacific	45.
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5147 ☐ Orbits	35.
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3469 EtherLink II/16 TP	169.
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8463 VGA Wonder XL24 (with 1 MB)	149.
2382 Graphics Vantage VGA (with 1 MB)	225.
9822 8514/Ultra (with 1 MB) (requires VGA)	289.
2012 Graphics Ultra with VGA (with 1 MB)	329.
3902 Stereo•F/X (sound board)	109.
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7138 (8 MB)	459.
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8397 Internal 14,400 Baud V.32 FaxModem	219.
6998 I/O Board for AT	49.
6999 I/O Board for PS/2	69.
8380 BasicVGA (256K, 640 x 480)	49.
8381 SuperVGA (1 MB, 1024 x 768)	115.
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7400 2 Position Laser Compatible Switch Box	109.
7501 CPS1021 (electronic switch box)	135.
Brown-Wagh ... 1 year	
8578 Creative Labs Sound Blaster	109.
2336 Creative Labs Sound Blaster Pro	189.
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6138 387DX-33	85.
6126 387SX-25	69.
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COVOX ... 1 year	
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Curtis ... lifetime	
1708 Ruby-Plus SPF-2+	59.
7358 Command Center SPF-4	79.
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MATH COPROCESSORS	
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9876 FasMath 83D87-33	89.
9877 FasMath 83S87-16 (SX compatible)	69.
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8333 Speedstar 24X	179.
6945 Stealth Hi-Color	239.
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1906 FX-850 (80 col., 264 cps, 9 pin)	319.
1904 FX-1050 (136 col., 264 cps, 9 pin)	449.
2358 LQ-570 (80 col., 252 cps)	289.
2361 LQ-870 (80 col., 330 cps)	489.
2357 LQ-1170 (136 col., 330 cps)	669.
5184 LX-810 (80 col., 180 cps, 9 pin)	185.
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3670 33 MHz 486N Motherboard for AT (1 MB)	1229.
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5024	ULTRA 144 Modem..... 799.
1345	OPTIMA 24 Modem..... 155.
3522	OPTIMA 96 Modem..... 389.
8187	OPTIMA 24+ FAX 96..... 159.
7395	OPTIMA 144+ FAX 144..... 479.
9884	Pocket Edition 2400..... 119.
Hewlett-Packard ... 1 year	
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5990	SatisFAXtion Model 100..... 99.
5992	SatisFAXtion Model 200..... 299.
5994	Model 400. 399. 5995 Model 400E..... 449.
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6003	ⓂFAXability Plus OCR (software)..... 165.
2994	EtherExpress 16 or 3021 16 TP..... ea. 129.
6418	OverDrive Processor (for 486SX-25 MHz)..... 579.
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7899	Expert Mouse serial... 99. 7900 bus..... 115.
3311	MasterStand..... 59.
3312	LaserStand (for HP LaserJet)..... 125.
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4518	101 Plus Keyboard..... 99.
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2343	Trackman Portable..... 99.
7975	ScanMan 256..... 269.
3295	MouseMan (combo) 69. 9766 (cordless) 89.
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5638	MultiMedia PC Upgrade Kit 16..... 969.
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6497	AudioPort..... 135.
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6574	T396FM Fax Modem (9600 baud)..... 499.

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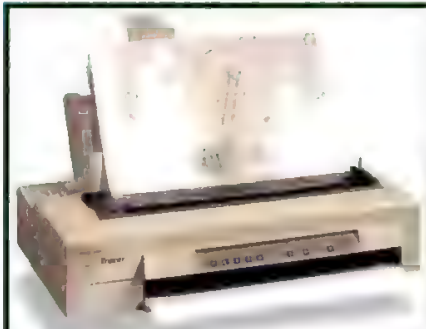
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4252	MultiSync 3FGX Monitor (14").....	689.
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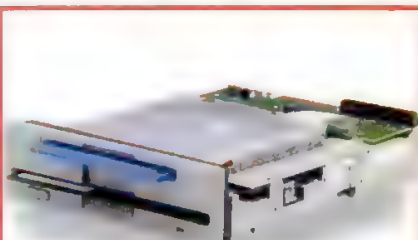


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4804	Pocket Fax Windows.....	219.
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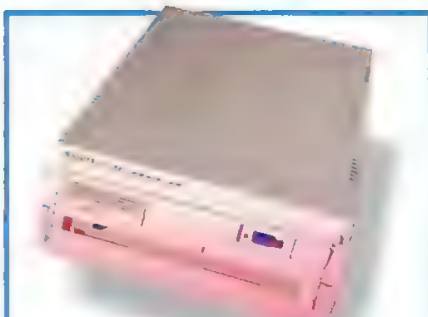
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6343	PC Powered 90 (incl. PC2B & cart.)		499.
6344	PC Powered 90 PRO (incl. PC2B, cartridge & Central Point Software)		599.
2500	PC2B-2 Controller		149.
2530	90 MB Cartridge	149.	2487 Tripak
8480	Tape250 Insider Tape Backup		239.
8481	Tape250 Inside Half-Height Tape Bckp		259.
8482	Tape250 PC Powered Tape Backup		359.
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3812	FS8500 IDE Tape Backup (304 M)		499.
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6577	CDR37 Portable CD-ROM Drive		399.
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6581	CDR84 for PC/XT/AT		599.
7023	MPC Upgrade Kit (with CDR37)		949.
7021	MPC Upgrade Kit (with CDR84)		1079.
Pacific Film ... 1 year			
1304	1.2 MB External (for any parallel port)		239.
2761	1.44EX MB Ext. (for any parallel port)		239.

Quantum ... 2 years			
8304	Plus Hardcard II XL 50 MB (9 ms)		\$225.
8287	Plus Hardcard II XL 105 MB (9 ms)		389.
Summit Memory Systems ... 2 years			
6436	SE120 Tape Backup		215.
6438	SE250 Tape Backup		265.
TEAC ... 1 year			
6951	1.2 MB Drive for AT		65.
4670	1.44 MB Drive for PC/XT (3 1/2")		59.
4326	1.44 MB Drive for AT (3 1/2", w/Bastech)		75.
4414	3 1/2" 5 1/4" Dual Floppy Drive		145.

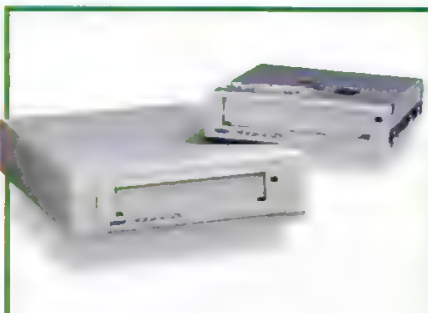
MEMORY

6556	256k DRAMs (100 ns, set of 9)		19.
5510	1 MB x 9 SIMMs (80 nanosecond)		45.
2497	4 MB x 9 SIMMs (80 nanosecond)		139.
5746	1 MB Chips (80 ns, set of 9)		45.



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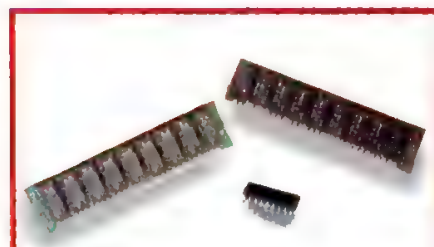
DISKS/MEDIA

3M ... lifetime			
3943	DC2000	17.	1581 DC2120
Fuji ... lifetime			
2214	3 1/2" DS Disks (10)	9.	2242 (50)
2215	3 1/2" HD Disks (10)	15.	2241 (50)
2239	3 1/2" HD Color Disks (Qty. 10)		18.
2243	3 1/2" DS Color Disks (Qty. 10)		10.
Sony ... lifetime			
3292	5 1/4" HD Disks (Qty. 10)		11.
3297	3 1/2" DS Disks (10)	9.	6148 (30)
3298	3 1/2" HD Disks (10)	15.	6375 (30)
8185	QD2040	14.	1895 QD2120

Toshiba ... 2 years			
4858	3 1/2" 2.88 MB ED Disks (Qty. 5)		\$30.
9755	3 1/2" 2.88 MB ED Disks (Qty. 10)		55.

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PC CONNECTION

learned your way around one, you can apply what have you learned throughout the package.

Searching through saved mail for a particular message or group of messages is, once again, as easy as filling in the blanks of a Search form. Messages can be

e-mail system. The Forms Designer package, though not required, may greatly enhance the work-flow capabilities that the Rules bring to this package.

Message-based rules are easy to learn and create in the three-part Rule Editor provided. Users with little or no program-

ming experience can create rules using the plain English commands. On the other hand, advanced programmers can type commands into a text file and use the Import command to convert it into a rule.

PC Magazine Labs installed and tested the older DOS version and the new Windows version of BeyondMail. The two work together and share the same in-box di-

rectories and address book. The Windows version offers more-robust administration utilities, though those utilities work for mailboxes and directories set up for DOS users as well, eliminating the need to run separate maintenance and administration tasks for each platform. (Version-specific utilities are required for user-interface desktop configurations.)

Network administrators can control their organizations' BeyondMail environment more than is possible in many other programs. In the Windows version, for example, administrators can set up "profiles" with one of four different levels of security (or "permissions") and assign them to users, and can set global or individual profiles or settings. Permission levels exist for each configurable option. The four levels of permissions are: users may modify options; users may read only; users cannot see options; private modification disallowed. In Windows, the administrator can also control the customizable icon bar and prevent users from customizing it if the company decides to standardize the interface.

BEYOND EXPERIENCE

BeyondMail requires an experienced person to install and maintain it. Its manuals can be maddening. The administrator's manual, though it contains most of the important information an administrator needs, lacks clear organization.

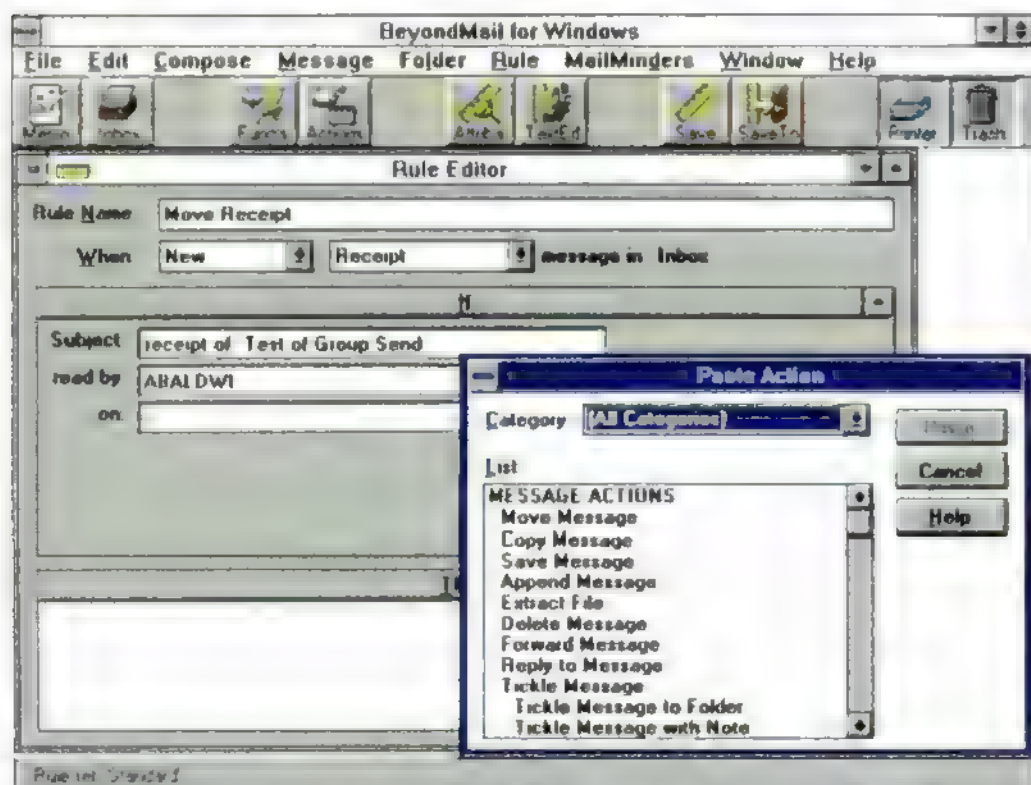
The DOS and Windows versions share the same directory structure, address book, and utilities, so you can link the versions across platforms and make all your changes from within one. Many of the utilities are designed to be run from DOS, although Rules and user-configurations settings are done from within the BeyondMail user interface.

EXECUTIVE SUMMARY

FROM THE DESKTOP BeyondMail's "rules"-based language represents one of the most significant and powerful features among all the e-mail products reviewed here.

FROM BEHIND THE GLASS DOOR It's an excellent program for the administrator who takes the time to learn and use the rules. They can automate many management tasks.

The utilities for updating the address book worked well and are finely tuned to the administrator's needs. For example, one utility adds new NetWare users and groups to MHS and the BeyondMail public address book. Another adds names to the BeyondMail address book, and a third makes changes to the address book and MHS. For adding long lists of users and creating the files needed to store



Users select rules from a pull-down menu to build a program that customizes BeyondMail to manage their e-mail.

queried within a single folder or across all folders by sender, recipient, carbon and blind-carbon recipients, date, subject, attachments, and message text. Searches can be limited to a particular form or expanded to include all types of forms.

After installing BeyondMail on your workstation, you can elect to have it search your hard disk for applications and auto-configure the application-launching mechanism. Applications that aren't recognized by auto-configuration can be added manually. Files attached to your mail can then be launched in their native application directly from BeyondMail.

BEHIND THE GLASS DOOR

BeyondMail, the most highly customizable of the e-mail programs reviewed here, requires the skill of a developer or power user who works closely with the network administrator in managing the forms and house rules that affect all users. Not surprisingly, Beyond offers courses in BeyondMail administration and Rules development.

Without BeyondRules, BeyondMail would have little to distinguish it from other e-mail programs. A certain amount of Rules manipulation is essential for an administrator to run even the most basic

directories and address book. The Windows version offers more-robust administration utilities, though those utilities work for mailboxes and directories set up for DOS users as well, eliminating the need to run separate maintenance and administration tasks for each platform. (Version-specific utilities are required for user-interface desktop configurations.)

Network administrators can control their organizations' BeyondMail environment more than is possible in many other programs. In the Windows version, for example, administrators can set up "profiles" with one of four different levels of security (or "permissions") and assign them to users, and can set global or individual profiles or settings. Permission levels exist for each configurable option. The four levels of permissions are: users may modify options; users may read only; users cannot see options; private modification disallowed. In Windows, the administrator can also control the customizable icon bar and

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their mail, Beyond offers a utility that works with a text file—but properly formatting that text file takes time.

An annoying quirk in both versions is the need to rerun the install program from the floppy disk each time new users are added. The only way to avoid inserting the floppy is to use the MULIST program, which is better suited to adding users in batch mode. This is inconvenient because MULIST uses a text file that you must also format according to its requirements.

BeyondMail comes with a “rule set” that automates its directory propagation. Administrators can adjust the rule set to suit their needs, or they may prefer to manually propagate the directories.

We discovered just how well the REBUILD.EXE utility to repair corrupted indexes worked when we accidentally corrupted BeyondMail and could no longer find other users on the system. After REBUILD finished running, everything worked well again and the problem did not recur.

FACT FILE

BeyondMail for DOS, Version 1.1

BeyondMail for Windows, Version 1.0

Beyond Inc., 38 Sidney St., Cambridge, MA
02139; 617-621-0095; fax, 617-621-0096



List price: For server and 10 users, \$995; for additional 20 users, \$1,995; for additional 100 users, \$9,500.

Requires: Server: No RAM, 3.5MB hard disk space. Workstation: 1MB RAM, 5.2MB hard disk space. DOS 3.1 or later, Microsoft

Windows 3.x for Windows workstation.

In short: This package is not for the fainthearted or those who just want good e-mail. BeyondMail is a strategic product. It uses its rules to automate workflow throughout an organization by aiding individual users in organizing, routing, and forcing appropriate action on their e-mail. It would be beneficial to organizations that are downsizing from host-based to LAN-based systems and that are used to and require some of the routing and workflow capabilities of mainframes as well as strong e-mail.

ON READER SERVICE CARD

Lotus Development Corp.

cc:Mail for DOS

cc:Mail for Windows

BY STEVE RIGNEY AND
M. KEITH THOMPSON

Even before they carried the Lotus and Microsoft logos, cc:Mail and Microsoft Mail (then Network Courier) were engaged in a head-to-head competition for market share. Today, thanks to the backing of Lotus Development Corp., the cc:Mail team has added an excellent Windows version of cc:Mail, continued to expand and refine the product, and fired yet another shot across the bow of Microsoft Mail.

Reasonably priced at \$640 for eight users, cc:Mail's modular pricing scheme can get expensive as options are added. As the scope of your mail system grows, cc:Mail quickly becomes expensive. While it is affordable enough to add users to existing post offices (\$845 for 25 users), connecting multiple locations and adding remote users is not. Gateways to other e-mail systems range in price from \$995 to \$2,995. The cc:Mail Remote program for individual users is \$295 per user.

END USER

The interface of cc:Mail for Windows, Version 1.11, is built around a highly configurable button bar. Although the bar doesn't support drag-and-drop, users pop up a dialog box to easily add, remove, and change the order of the buttons. In fact, so many options are offered to customize the interface that a user could get lost looking for the icon that performs just the right task. Many of the dialog boxes, however, can be disabled and you can streamline the operation by turning off confirmation notifications such as “Do you want to send this message?” A click of the mouse button executes almost every action. The only time you'll turn to the keyboard is to type the message itself.

cc:Mail supports Windows' MDI (Multiple Document Interface), a feature that lets you work within multiple windows in the same application and lets you control multiple messages, mailing lists, and on-screen message text using Windows' drag-and-drop. To address a message, for in-

stance, you simply drag a particular address from the mailing list and drop it into the address field of the message header. MDI support is great for larger organizations with several long mailing lists: It enables you to have multiple address books open at once, from which you can select whatever addressees you need. You can also add attachments using drag-and-drop. And cc:Mail for Windows allows you to automatically launch certain Windows applications—namely Lotus 1-2-3 for Windows, Ami Pro, and Microsoft Word—associated with the attachments without leaving the cc:Mail program. All you do is click on their message attachment icon. There is also a built-in capability to launch other Windows applications from within the cc:Mail program.

cc:Mail also supports DDE (Dynamic Data Exchange), particularly for other of Lotus's Windows applications such as Ami Pro and Lotus 1-2-3 for Windows. Creating DDE macros for other non-Lotus applications, however, can become an overly complicated task; it's not recommended for the novice user.

SUITABILITY TO TASK

cc:Mail for Windows

	POOR	FAIR	GOOD	EXCELLENT
Basic messaging	☒	☒	☒	☒
File management	☒	☒	☒	☐
Interprocess communications	☒	☒	☒	☐
Mail server installation	☒	☒	☒	☒
Client installation	☒	☒	☒	☐
Maintenance	☒	☒	☒	☐

Unlike many other e-mail applications, cc:Mail for Windows contains a good text editor (somewhat resembling Windows' Notepad) that includes word wrap, some font capabilities, and a color highlighter that lets you add up to 128 color combinations to your messages. Using the highlighter, you send messages back and forth between several people and identify each participant's comments by using a separate highlight color for each person. cc:Mail treats bulletin boards more like mailboxes, allowing any user to post open messages to other users.

The user interface of cc:Mail for DOS, Version 4.0, presents you with text menus that you can easily navigate once you become accustomed to their quirky key assignments. Users must learn when to hit

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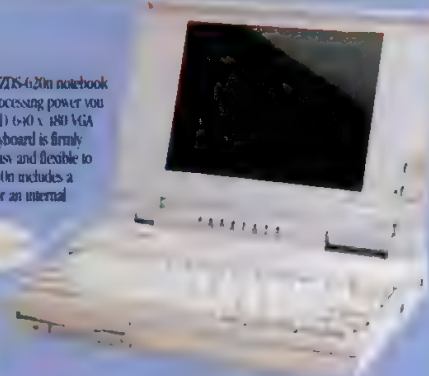
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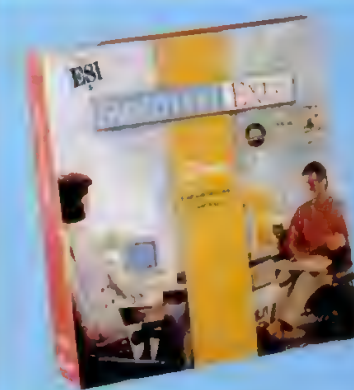
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PackRat 4.1 BS2894

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FastLynx is two programs for the price of one! High speed data transfer between computers up to 8 megas per minute and remote computer disk drive and printer sharing. FastLynx is accurate and easy to use. Just connect two PC's with the cables included to either the serial or parallel port; then, simply move data from one directory to another. On a Novell network, bypass the server for quick easy station-to-station transfers. PC Magazine "Editors' Choice." Publisher: Rupp Corp. UT2644



\$99

Iomega Tape250 Insider



The Iomega Tape250 is the only 250 MB QIC-80 drive that fits a standard one-inch drive bay, reads both QIC and Irwin formatted tapes, works with other QIC-80 tapes and software, is optimized for Windows 3.1, and installs with just four screws. Its dual speed - 500 or 1000K

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Manufacturer: Iomega DR2400

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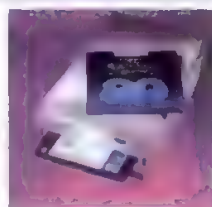
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Bernoulli PC Powered

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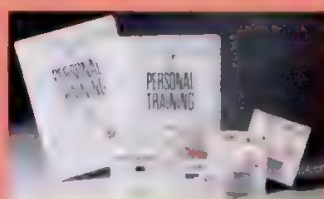
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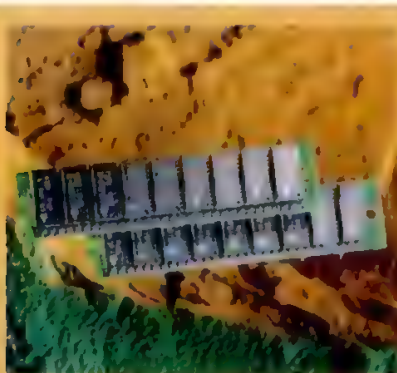
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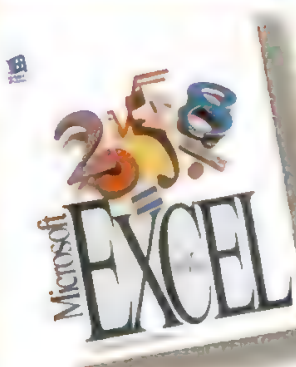
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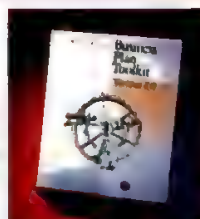
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■ QuickMail: Mac Servers for PCs

by Michael Miley

You are running a multiplatform business that uses Apple Macintoshes, and either you're already running CE Software's QuickMail and want to connect it to the rest of your e-mail network, or you're looking to buy e-mail for your Macs and you've heard that QuickMail is the Macintosh leader. What can you expect from QuickMail as a team player on your mixed network? Is it worthwhile to set up QuickMail in a PC house?

QuickMail is exceeded only by cc:Mail in the number of gateways it offers to other e-mail systems. Gateways are available for systems such as DEC All-in-One, IBM DISOSS, and IBM PROFS, as well as cc:Mail and Microsoft Mail for PC Networks. Connections to MHS-, SMTP-, TCP/IP-, and UUCP-based systems are available, and X.400 connections can also be had from Alisa Systems, WorldTalk Corp., and InterCon Systems, though an intermediary between QuickMail and an X.400 system (e.g., MailMate/QM) may also be needed. For the most part, these gateways enable messaging across e-mail systems and some also allow file enclosures. Check each gateway vendor (a list is available from CE Software) for the features each gateway offers.

IN A PC WORLD

For those thinking of installing QuickMail on PCs, two DOS options are currently available. Both possess windowing systems mapped to the Mac client. PC networks with AFP (AppleTalk File Protocol) modules installed on Banyan VINES, Microsoft's LAN Manager, or NetWare (2.x or 3.x) can run QuickMail for DOS with file servers on their client PCs. DOS clients connected in this way can expect nearly all of the feature set of their Mac counterparts except real-time conferencing. PCs attached directly to an AppleTalk network (via AppleTalk

cards and drivers) get a slightly fuller set of QuickMail features, including conferencing. A Microsoft Windows client is also in the works, expected sometime in the fourth quarter of 1992. Expected too are MHS-based clients for both the Mac and Windows in the first quarter of 1993. Until the Windows client is available, however, QuickMail's mixed-client capability is not superior to Microsoft Mail's or cc:Mail's, nor does it offer the Mac-to-DOS-and-back group schedule swapping of WordPerfect Office.

IN ITS OWN DOMAIN

When it comes to e-mail features, however, QuickMail is the most fully featured program on the Mac, and DOS QuickMail clients can access many of these features.

QuickMail's strengths include a public bulletin board, a good filing system with sorting but no drag-and-drop or searching, up to 16 file enclosures (as opposed to 20 for cc:Mail and 99 for WordPerfect Office), a mail log with Unsend for tracking outgoing mail, a QuickSend feature for rapid memoing, and a quick enclosure process that lets you save and send your current document. Bitmapped graphics enclosed in the Windows Clipboard can be displayed and voice messages can be sent using an Apple or third-party microphone such as Farallon's MacRecorder and driver. DOS users can hear these messages.

QuickMail also supports outgoing fax (with a fax modem), as well as paper output to recipients without computers. Custom forms, for messaging or fax, can be designed using the QuickMail Forms program, and the forms can be installed by the user at his

or her workstation. These forms are very useful for designing office forms for meetings, phone calls, approval, data entry, and the like, though graphics used on Mac forms do not display on the DOS clients. But using CE Software's Data Collection Bridge (a separate program) in conjunction with QuickMail's form capability lets you collect data, such as spreadsheet information, whether you're on a PC or a Mac, and centralize its access at the QuickMail server. In combination,

QuickMail's forms capability is extremely useful. In fact, nearly all of the above features are available to the DOS clients as well, with AppleTalk DOS clients getting conferencing, too.

Like WordPerfect Office, QuickMail has real-time conferencing. Users start a real-time conference by

pulling up a conference window, seeing who's connected, and checking off the names of those they wish to include in the conference. Those users receive a message notifying them of the conference. This interrupts their work unless they've turned off the option for a specified time. Messages can travel across servers. Transcripts of conversations can be saved locally at each participant's workstation.

MAIL'S STILL QUICKER

While QuickMail leads in features on the Mac, it is slower than Microsoft Mail on large networks with lots of mail. Where QuickMail follows a file-based strategy for storing mail, Microsoft Mail uses a database strategy that accesses files more efficiently. When many users are trying to access their mail, QuickMail must manage

*QuickMail has its own
built-in communications
software with flexible
administrative settings
for baud rate, dial-up
times, time-outs, redials,
batched mail, and the like.*

multiple file accesses for user folders stored separately on the server disk. Additionally, QuickMail clients build a mail list every time they're opened, while Microsoft Mail automatically updates the client's mail list in the background. Under System 7, users can avoid repeated waits for long message lists to assemble by leaving the QuickMail DA open and hiding it. New messages are added to the list as they arrive and the whole list needn't be reassembled.

MANAGEMENT FEATURES

For remote server-to-server connections, QuickMail has its own built-in communications software with flexible administrative settings for baud rate, dial-up times, time-outs, redials, batched mail, and the like. QuickMail provides different software "bridges" depending on your corporate needs: the QM-QM bridge for multiple QuickMail sites, for example, or the QM-Direct bridge for single connections, as well as others. Asynchronous gateways to other e-mail systems are installed at the administrator site.

Macintosh users also have their own individual asynchronous connection, called QuickMail Remote, which lets them retrieve mail when they're away from the office (some users favor System 7's AppleTalk Remote for ease of use in dialing up the office's server, however). Most of the higher baud rate dial-up problems that occur with QuickMail 2.5 have been rectified with version 2.5.1 and with the new Apple Modem Tool 1.1.1.

As with all e-mail systems, QuickMail's administrator tools center around key operations: setting up new servers, usernames, and routing information; registering servers with the NameServer for automatic updates of the master namelist; maintaining "bridges" and gateways; and setting up file storage options and dated cleanup of old user messages. QuickMail's NameServer maintains a list of all mailboxes on the internet, whether they're DOS or Mac clients. Foreign names (from other e-mail systems) are

added to the NameServer with incoming mail. All QuickMail users have access to this list and can add names to their private address books. Though address-book maintenance is the user's responsibility, users are automatically notified of changes on the internet. They can then run a simple "verification" program to register the changes.

Unlike Microsoft Mail, QuickMail lacks its own backup or mirroring system (cc:Mail's tools must be purchased separately). NetWare's fault-tolerance system is no help here, since all DOS QuickMail administration is done from the Mac side. WAN (widearea network) routing management should improve, however, with CE Software's acquisition of Sitka's InBox technology, which is noted for its routing talents. For the most part, though, QuickMail provides you with most of the management tools you need, including on-line help, allowing you to tweak your system to your heart's content.

IS THE RACE TO THE QUICK?

QuickMail is a strong, capable option for PC networks adding or enabling a Mac domain. It fares well against Microsoft Mail and WordPerfect Office, edging out the first for sheer feature set and the latter for gateway connectivity. Its real competition these days is cc:Mail, however. The new Mac version, 2.0, is right on QuickMail's heels in terms of features, while cc:Mail's offerings as a whole are broader and deeper than CE Software's. Shops that already have QuickMail will find it to be a viable player in the mixed e-mail scene. But DOS and Windows shops that are just now Mac clients to their e-mail systems will want to take a close look at cc:Mail. □

QuickMail, Version 2.5.1 CE Software Inc., P.O. Box 65580, 1801 Industrial Circle, West Des Moines, IA 50265; 800-523-7638, 515-224-1995; fax, 515-224-4534. List price: *One user, \$199; five users, \$399; ten users, \$599.* Circle 474 on reader service card

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SOFTWARE

e-Mail Software

the Esc key and when to hit one of the special function keys to go from an action screen to a menu. Occasionally, you'll hit Esc when you should have hit F10 and you'll wind up one menu layer higher than you wanted, but the program is forgiving. If this happens, it does not lose the messages you are reading or preparing. You can simply jump back to your previous screen to find it.

The DOS version can be run as a TSR or a normal executable program. The TSR requires approximately 16K of conventional memory and provides a menu to invoke the executable cc:Mail program or configure the program to alert you when new messages arrive in your in-box.

While most other e-mail applications simply give the option of beep or no beep, cc:Mail's notify program offers you the option of using an audible sound, a flashing icon, a pop-up message screen, or both. You can associate the sound with certain priority messages, the icon with others, or choose how often the notify utility should poll your mailbox for any new mail.

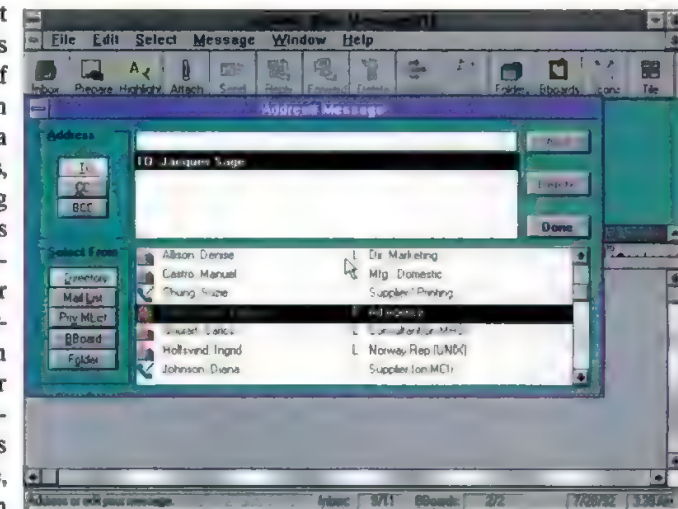
While the DOS version of cc:Mail's text editor does not offer all the same features as its Windows counterpart, it does offer some unique functionality. Using cc:Mail's key-customization feature, you can remap the keys used in the text editor to match cc:Mail for Windows or Ami Pro for Windows. Like the DDE capabilities of the Windows version, this is not always an easy task and is best left to experienced users or the mail administrator. The

It is simple to sort and store messages in either version of cc:Mail. You can store messages in a variety of ways, ranging from tucking them into folders you create to sending them to other mailboxes in different post offices on the same file server or in remote locations. Search fields include date, time, priority, and certain text strings. Old messages can be easily archived to the hard drive or a floppy for easy retrieval at a later time.

The optional remote-user package, cc:Mail Remote, allows employees working at home or on the road full access to cc:Mail simply by accessing their network via a modem and dial-up telephone line. The remote product has exactly the same interface as the DOS version of cc:Mail and possesses the same capabilities as the network program.

ADMINISTRATOR

As easy as cc:Mail is to use, setting it up demands more time and patience as office needs grow. cc:Mail supports (but does not require) MHS and can be easily installed if your organization is small and



cc:Mail for Windows allows you to drag and drop addresses and attachments from multiple windows.

e-mail system requires a considerable amount of time and expertise to track and delete aging messages, recover unused disk space, and maintain the database. Thankfully, each cc:Mail product comes with detailed documentation.

Lotus licenses cc:Mail as separate modules. You'll need two modules—the \$495 Platform Pack and a User Pack (\$195 for the eight-user version, \$595 for the 25-user version)—just to get started. For each client operating system, you will need a separate Platform Pack. If you have both DOS and Windows clients on your network, for instance, you'll need two Platform Packs. If you also have Macintoshes, you'll need a third.

cc:Mail installs quickly. After answering a few questions about your network, you key in your cc:Mail serial number, enter a post office name and password, identify the location of your mail files, and begin adding user names and passwords. cc:Mail comes with a conversion utility that imports user information from NetWare and VINES user lists, but it is not the easiest utility to use. There is no on-line help to prompt you through the procedure. What's more, the utility imports all the user names as a single group, and you must manually assign each name to its respective post office. The program encrypts the message databases.

cc:Mail comes with three different utilities—CHKSTAT, RECLAIM, and CCBACKUP—to facilitate ongoing maintenance. Depending upon the amount of traffic on your network, you'll

EXECUTIVE SUMMARY

FROM THE DESKTOP While the program is easy to use and the wealth of icons are fun to play with, the absence of easy-to-access technical support can be frustrating.

FROM BEHIND THE GLASS DOOR Lotus Development Corp.'s cc:Mail is a capable product, but it needs to be more intuitive and user-friendly.

cc:Mail for DOS text editor also has a built-in spell-checker and a text-search feature. You can execute block moves and import text, or you can launch your favorite DOS applications from within cc:Mail to edit and read certain attached messages.

you don't need the multiple post offices and gateways that cc:Mail offers large enterprises. But the difficulty of installation will grow in proportion to the size of your network. The package requires you to set up a post office for each workgroup or network on your system. In most cases, organizations will have one post office per server, though you can create separate post offices for separate workgroups. These post offices are the central exchange point through which the program distributes mail. But maintaining a large

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"When it has to work right"

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CODE A4615



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WordPerfect answers the most-asked question about electronic mail.

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An In Box Is Not Enough

In addition to the In Box that every e-mail package offers, WordPerfect Office gives you an electronic Out Box. So in addition to all the usual things you'll be able to do with your incoming mail (including read, reply, forward, save and print), we give you unusual control over your *outgoing* messages as well (including the ability to reread, rethink, rewrite and retract).

And the Out Box is just one of the features that separates WordPerfect Office from the rest of the e-mail pack.

E-Mail Everyone Can Agree On

If people would simply agree on a single computer platform, hooking everyone up with an e-mail system would be no trick. But since *that* shows no signs of happening, WordPerfect

Office is available for all of the most popular platforms, including DOS, Windows, Mac, UNIX, VAX and Data General.

With WordPerfect Connections (included in Office 3.1), a DOS and Windows LAN can connect seamlessly (and transparently) with VAX and UNIX LANs, for example. So a message that goes out in Windows can arrive in UNIX and lose nothing in the translation.

Getting Your Message Out

Far-flung empires will find WordPerfect Office equally accommodating, with gateways to messaging systems that include Novell MHS, IBM OfficeVision, DEC, X.400, SMTP, MCI Mail and AT&T EasyLink, among others.

And unlike e-mail packages that simply deliver the mail, WordPerfect Office includes powerful Calendar and Scheduling functions that provide entirely new ways for your people to work together productively.

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With WordPerfect Office, the possibilities are nearly limitless. And the technical support for users and administrators is widely acknowledged to be the best in the business. To learn more, contact your WordPerfect Representative, or for a free video demonstration, call (800) 526-5266.

(Until you have a more effective means of business communication up and running, the telephone will have to do.)

WordPerfect®

FACT FILE

cc:Mail for DOS, Version 4.0

**cc:Mail for Windows,
Version 1.11**

cc:Mail Inc., 2141 Landings Dr., Mountain
View, CA 94043; 800-448-2500,
415-961-8800; fax, 415-960-0967



List price: For DOS server and 10 users, \$640; for Microsoft Windows server and 10 users, \$840. Additional 25 users, \$845; additional 100 users, \$3,295.

Requires: DOS server: No RAM, 5MB hard disk space; DOS workstation: 390K RAM (460K RAM

with spell-checker), 1.4MB hard disk space. Windows server: No RAM, 5MB hard disk space; Windows workstation: 2MB RAM, 2MB hard disk space, Windows 3.x, DOS 3.1 or later

In short: cc:Mail is a powerful, complete e-mail system. It is a good choice for large multisite organizations and small single-file server networks. Multisite networks beware, though—in such an environment, cc:Mail requires substantial management time.

 ON READER SERVICE CARD

probably want to run each weekly or monthly to maintain good performance. CHKSTAT displays information about users and mailboxes, message traffic and size, and number and age of messages. RECLAIM lets you optimize the disk-space usage of your post office databases. cc:Mail includes the CCBACKUP program to copy open files so you can make tape backups.

cc:Mail's many gateway options connect its post offices with other post offices and e-mail systems over network bridges or telephone lines. The gateway programs can run on a low-end PC with a high-speed modem or even in a window under DESQview. Post offices (up to 99) may include multiple gateways to evenly distribute the load on large corporate networks. The gateway calls each post office or remote user as predetermined in a call list that contains an entry for each system. Administrators can easily control when cc:Mail's gateway calls other systems according to the time of day, day of the week, or number, size, and priority of outgoing messages.

For each communications session, the

cc:Mail Gateway module creates a log file that includes the start and end time, the number of messages sent, and the cause of any failures. The gateway also has a branching feature that allows you to exit to DOS and run other programs through batch files.

Automatic Directory Exchange, an option which costs \$995 per post office, works in conjunction with the \$1,295 cc:Mail Gateway to update the mail directory for an enterprise-wide e-mail system. Automatic Directory Exchange will automatically update other post offices and bulletin boards as you add, change, or delete users in one.

The \$295 cc:Mail Remote module lets distant users dial into the mail system by accessing a program in the Platform Pack that accepts only incoming calls. For extra security in your e-mail system, cc:Mail Gateway features Callback, in which the gateway can be set up to suspend the connection on incoming calls and return the call of the remote user at a phone number that the administrator enters into the program.

Lotus Development Corp.'s cc:Mail offers top-notch e-mail functionality and, interestingly, is best suited for either large or very small offices. Its powerful options can accommodate the needs of large companies that want gateways and remote support for distant users. On the other hand, small organizations with only one post office to maintain will find administration a snap. It is only when you manage multiple post offices that the task becomes difficult and requires the service of an experienced systems manager.

DaVinci Systems Corp.

DaVinci eMAIL for DOS

DaVinci eMAIL for Windows

BY RON ANDERSON AND
SALLY BLANNING DEJEAN

In November 1991, DaVinci Systems released a major update (Version 2.0) of DaVinci eMAIL for DOS. Since then, DaVinci has released a maintenance version, taking the DOS client to Version 2.01. But at the time of our review, the Windows client upgrade that would keep these products in sync was still not available (DaVinci eMAIL for Windows, Ver-

sion 1.8a, is reviewed here). DaVinci promised Version 2.01 for Windows would be shipping by the time this review was printed.

The problem these out-of-sync products presented was compatibility. The mail database for the DOS client was not compatible with the Windows client database. Users will welcome the Windows upgrade (see the sidebar "E-Mail Evolution: Works in Progress"). And, at \$295 for a ten-user starter pack (\$489 with NetWare's MHS), DaVinci eMAIL for DOS was better and offered more features than the Windows version we tested that cost \$445 for an eight-user pack.

END USER

DaVinci eMAIL for DOS offers a state-of-the-art user interface for DOS users that takes advantage of drop-down menus, scrolling list boxes, radio buttons, check boxes, and toggle switches. Mouse users as well as keyboard users should feel equally at home; this user interface does not discriminate.

After logging into eMAIL, the mailbox window opens and is ready to use. The main menu stretches across the top of the screen and a status bar extends across the bottom. Items in the menu include selections for getting help, creating a message, accessing mailbox options and system options, managing mail folders, and setting up a mailbox.

DaVinci supplies a mail notification TSR program that runs in the background. The TSR can be launched from the DOS prompt or the AUTOEXEC.BAT with the command *email -i*. Press the user-definable hotkey after starting the TSR and the full eMAIL application opens. The TSR occupied 5.3K of memory in our test configuration and uninstalled cleanly.

When new mail arrives, the TSR plays a little tune for users who are running graphical programs at the time. (You can pick your favorite ditty from the long list supplied by DaVinci.) If you aren't using a graphical program and the pop-up option is on, the full eMAIL application automatically starts when new mail arrives.

Multiple addresses and mail groups can be entered in message headers. The message editor includes text auto-wrap, spell-checking (a real bonus for some of us) and cut, copy, and paste commands.

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Competitive Analysis

	Tecmar 720	Brand X	Brand Y
Capacity	720 MB	525 MB	525 MB
Speed	15 MB/min	11 MB/min	11 MB/min
Software	DOS, OS/2, Windows, Novell	DOS, OS/2, Windows, Novell	DOS
Price	\$1888	\$3695	\$3995

Prices include adapter and software

QICVault and QTOS are registered trademarks of Tecmar Corporation.
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CIRCLE 384 ON READER SERVICE CARD

SOFTWARE
e-Mail Software

Message-handling options include the ability to set the mail priority, request a receipt, and encrypt mail. The settings you select can be saved as defaults for future messages.

Incoming messages can be stored in folders. Message searches are limited to one folder at a time. Searches can be conducted by sender, subject, or date. You

SUITABILITY TO TASK				
DaVinci eMAIL for DOS				
	POOR	FAIR	GOOD	EXCELLENT
Basic messaging	●	●	●	○
File management	●	●	○	○
Interprocess communications	●	●	○	○
Mail server installation	●	●	○	○
Client installation	●	○	○	○
Maintenance	●	●	○	○

can limit the scope of searches with some additional criteria; for example, you can search mail that only includes attachments.

DaVinci has implemented a nice feature to help you follow electronic conversations. Whenever your messages receive a reply or are forwarded, the exchange is automatically designated as a conversation and eMAIL keeps track of the conversation for you. You can view the thread of the conversation chronologically and can file, print, or delete the conversation if you like.

Viewers for text files, Microsoft Excel, Lotus 1-2-3, WordPerfect, and fax images allow you to view some attachments from within eMAIL. But it is not possible to launch applications from within the program.

DaVinci eMAIL lacks many of the features available in the other packages reviewed here. Specifically, the lack of a Search function that works across folders, limited file viewers with no launching capability, and the version incompatibilities between the DOS and Windows clients make this package an also-ran.

ADMINISTRATOR

DaVinci eMAIL for DOS is tightly integrated into Novell's NetWare and requires the expertise of a NetWare administrator to set it up properly. The Windows version we tested was not worth the extra effort needed to install and maintain it correctly.

DaVinci eMAIL is MHS-based. Both the Windows and the DOS client will run under other LAN operating systems, but with less ease in installation and maintenance than under NetWare. We ran into a problem when we installed MHS on the second volume of a new server. NetWare initially sets up the volume with 64 directories that expand as needed. Unfortunately, MHS wants to see at least 200 actual directories before it installs properly. We found a cumbersome workaround, but DaVinci needs to pressure Novell to fix this annoying feature. As the installation continued, it occasionally flashed error messages across the screen. There was no explanation of what the error messages meant, either in the manual or in on-screen help. Tech support explained that the warnings concerned names which were too long for MHS. Fortunately, these errors did not result in a corrupted installation with either client. eMAIL creates an ADMIN.LOG file to record every change made in MHS and eMAIL, which is helpful when the administrator is trying to track down how an event occurred.

The DOS install program automatically adds user names from the NetWare bindery. This worked well at PC Labs when we added 500 users. But unless you use a custom installation to select and assign eMAIL users to their workgroups, the program selects everyone as a single group. eMAIL's ADMIN utility adds new users to MHS and creates their eMAIL directories and files. When we deleted users through the easy-to-use Directory Manager and then ran the ADMIN to update our changes, eMAIL was smart enough to remove deleted mail users from the MHS directory, but not from the NetWare bindery. If they later need to be restored, it can be done manually.

Installation of DaVinci eMAIL for Windows did not go as well. The directions failed to inform us that the DOS and

Windows versions must be installed in separate directories. And their compatibility is limited. The DOS version uses a database structure for its mailbox, Windows a text structure. At one point eMAIL for Windows stalled because it could not handle all the names in the bindery. DaVinci's efficient tech support, which seemed to have a written explanation and solution for every problem we called about, faxed us directions on how to correct the problem (we were instructed to break up the file).

Installing two distinct versions for DOS and Windows means the administrator maintains two eMAIL clients. Both versions of eMAIL are built as modular products. You buy what you need. For example, in order to synchronize directories across multiple servers, DaVinci sells the DaVinci Names Services to spare administrators from going to each host and running ADMIN every time a change occurs. It will also synchronize directories in external systems, if they are in an MHS organization.

Another good administrative tool is a



DaVinci eMAIL for DOS offers more features than the Windows version, which was being upgraded at the time of our review.

utility called LOCKOUT. It allows administrators to see who is running eMAIL, to warn users that the eMAIL is being shut down, and to log users off eMAIL after two minutes, without interrupting other network functions.

Another plus for the DOS version is the automatic installation of users' workstation software. The installation program creates an EMAILSYS.INI file and sets up the parameters for all users on the sys-

EXECUTIVE SUMMARY

FROM THE DESKTOP The fact that the DOS and Windows clients used two different mailbox structures at the time of this writing was a real drawback.

FROM BEHIND THE GLASS DOOR DaVinci eMAIL is a good but unexciting e-mail system. Administration tools rely heavily on NetWare for file management.

tem, although an individual may override the setting with his own .INI file. The Windows version requires the users to install the icon on the desktop.

Several options exist for security and disk-space considerations. Mailboxes may be installed as shared or individual. Shared mailboxes offer the advantage of saving only one copy of a message sent to several users by using pointers. Individual mailboxes offer greater network security and easier maintenance, though with either option users' mail remains private.

The menu-driven Directory Manager

lets administrators set up and maintain the routing between hosts, the list of valid MHS users, and the applications that work with MHS. DaVinci eMAIL uses the newer workgroup-based MHS addressing rather than the older, more complex host-based. A workgroup consists of the entire MHS network. It not only makes it easier for eMAIL users outside the network to address and send mail, but it also simplifies the administrator's work of maintaining users and adding and routing new hosts.

Futurus Corp.

Futurus Team DOS/Windows Combo

BY STEVE RIGNEY AND
M. KEITH THOMPSON

Originally fielded as Right Hand Man, the Futurus Team DOS/Windows Combo may have a new name, but it benefits from several years of development, debugging, and fine-tuning. At \$495 for the five-user version, Team competes well on price. A new Windows version and additional features such as Universal E-Mail and Enhanced Group Scheduler make the program an excellent workgroup productivity product and a user's tool that is not just an e-mail application.

Team is an information manager with e-mail and workgroup abilities rolled into one. Users will find a useful scheduler, several different databases for phone numbers, and a phone-message center alongside an e-mail system that doesn't give up anything to be part of an integrated information-management system. But it lacks message encryption and management reports to assist an administrator.

END USER

The DOS version of Team loads in memory as a TSR, and you can view the

menu at any time by hitting predefined hotkeys. You can also adjust the amount of expanded memory used by the FT.COM TSR. The standard configuration required 128K of RAM on each PC running Team in our tests. But it can be loaded high. And, while it consumes a large chunk of memory at the workstations, it requires no memory at the server.

Both the DOS and Windows interfaces are menu-driven, but they are separate programs. Where the Windows interface offers icons and multiple menus, the interface for the DOS product is based around a single menu from which you make your selections. From the menus, you can easily choose between your Electronic Mail, Phone Message Center, Group Scheduler, and the File Manager. On-line help is also available with a touch of the F1 key for both DOS and Windows.

Team's Windows interface is designed around grouped icon buttons representing each feature of the Team application. The only drawback with this design is the lack of an administrative Windows back end. You must perform all system administrator functions from the DOS version. You must also remember to start the FT.COM TSR before you start Windows, otherwise the program will not work. This can prove frustrating if you forget to load the TSR, particularly if your Windows Program Manager is full and requires a lot of time to start.

The newest Windows incarnation of Team includes several new features that make sending and receiving electronic mail a breeze. The most ingenious of these is called Universal E-Mail, which allows you to send e-mail without

leaving your current application. After creating a letter or message in your favorite word processor, you can select Print. Team will automatically appear and give you the option of sending the file to your printer or sending it as an electronic message. Similar tasks can be performed from within databases and spreadsheet applications. This feature is ideal for users who do not run Windows, DESQview, or any other multitasking environment and are

FACT FILE

DaVinci eMAIL for DOS, Version 2.01

DaVinci eMAIL for Windows, Version 1.8a

DaVinci Systems Corp., P.O. Box 17449,
Raleigh, NC 27619-7449; 800-328-4624,
919-881-4320; fax, 919-787-3550

List price: DOS version: For 10 users, \$295 (with NetWare MHS, \$489); for additional 30 users, \$995; for additional 100 users, \$2,995; for additional 1,000 users, \$19,995. Microsoft Windows version: For 8 users, \$445; for additional 30 users, \$1,095.

Requires: Server: No RAM, 4.5MB hard disk space. Workstation: 400K RAM, 100K hard disk space. DOS 3.1 or later, Windows 3.x for Windows workstation.

In short: Solid, reliable, and with all the standard features a good e-mail package should offer, DaVinci eMAIL is the kind of e-mail an administrator appreciates without getting too excited about it. It's utilities are good, but grouping so many functions—updating, correcting corrupted e-mail, checking routing—in the Admin program sometimes makes pinpointing a problem difficult.

458 ON READER SERVICE CARD

SUITABILITY TO TASK

Futurus Team for Windows

	POOR	FAIR	GOOD	EXCELLENT
Basic messaging	☒	☒	☐	☐
File management	☒	☒	☐	☐
Interprocess communications	☒	☐	☐	☐
Mail server installation	☒	☒	☒	☒
Client installation	☒	☒	☐	☐
Maintenance	☒	☐	☐	☐

■ E-Mail Evolution: *Works in Progress*

by Lance Ulanoff

E-mail, as a software category, has expanded and changed dramatically. Even its definition is evolving. No longer does e-mail simply mean transmitting, receiving, and managing electronic messages across a network and through gateways. Information-management and group-productivity functions are finding a place in e-mail. And many products, including some of those reviewed here, will undergo changes by the end of this year.

WordPerfect Corp. plans to revamp WordPerfect Office in its soon-to-be-released Version 4.0. At press time, an upgrade price had not been announced. The current version, 3.1, is \$495 for a five-user license.

WordPerfect is trying to shift the definition of e-mail to what it calls messaging, making the workgroup/work-automation/e-mail package more e-mail-centric with tighter integration among e-mail, scheduling, calendaring, and other features.

The new version will make greater use of "rules"-based functionality, one of the most powerful emerging technologies in e-mail. *Rules*, which are essentially macros and easy-to-use programming scripts, help users manage incoming mail without even opening it. These new features, combined with a completely revised system of folders that WordPerfect plans for Version 4.0, could evolve Office into a very powerful package. WordPerfect will also introduce work flow functionality, such as message distribution, which structures the way messages are received.

Another important feature of Version 4.0 is that it runs on a cross-platform C++ engine, which should ease the exchange of information across a network to Windows and DOS clients, and even to Macintoshes. This new kernel should also add sound capability, allowing platforms that can handle audio to play back attached sound bytes. In addition, the DOS client is expected

to be far more graphical than previous versions and will even include a button bar. WordPerfect says there will be two modes for the DOS interface: GUI and TUI (textual user interface). Both include sizable, movable windows, but GUI goes a step further with the shadowed, sculpted look associated with Windows applications.

One nifty new administrative tool is the ability to schedule an event. For example, a systems administrator can set up an "auto-date" to execute events at specific times and days.

WINDOW CLEANING FOR DAVINCI

By the time you read this, DaVinci Systems Corp. should have released DaVinci eMAIL for Windows, Version 2.01. The retail price and upgrade price were unavailable at the time of this writing. The current version, Version 1.8b for Windows, is priced at \$445 for eight users. Version 2.01 has been designed to match the functionality of DaVinci's popular DOS product and compete head-to-head with packages like cc:Mail for Windows and Microsoft Mail for PC Networks. The new version also corrects a major incompatibility problem between the DOS mailbox and DaVinci's earlier Windows version. With this upgrade, both will use the same mailbox so that messages can be easily viewed and manipulated from either platform.

DaVinci eMAIL's user directory reportedly supports more than a million users and recognizes full names. Its more notable attributes include hierarchical folders and unlimited message duplication. This latest version is also modular so that DaVinci can more quickly and easily upgrade the different modules.

Among the other new features included in this release is the ability to

work with multiple messages. A Mail Browser function opens a window on-screen to display the text of the currently highlighted message, much like a message-preview screen. There is also an 80,000-word spell-checker, support for drag-and-drop, a wastebasket for deleted mail, and a conversation search function that allows you to view messages on a particular topic in the sequence in which they were created.

Not every feature from the original

Windows product will find its way into this one. For example, high-end DDE (Dynamic Data Exchange) functionality (such as querying a database) has been trimmed away in favor of more widely used DDE fea-

tures like the ability to send mail from an application via a DDE command.

NOW IN REACH

Reach Software Corp.'s MailMAN e-mail package didn't qualify for our review because it lacked a DOS client. But Reach will rectify that situation with its new MailMAN for DOS, Version 1.0, which is scheduled to ship later this year. The DOS client is designed to match the functionality of MailMAN 2.0 for Windows which was released earlier this year. But it won't, as the Windows version does, take advantage of some key Windows features such as DDE and drag-and-drop.

Reach has taken a modular approach to provide some intriguing features in their e-mail software. Mail Archiving, Conferencing, Bulletin Boards, Forms Pack, Mail Sorter, and Filtering, which uses rules-based functions, and a spell-checker are all available as optional modules.

Reach has also introduced a remote mail package called Personal MailMAN. It supports a full off-line folder system, an off-line directory, off-line composition, and deferred send and receive features. At this time, none of these MailMAN products support

Many products, including some of those reviewed here, will undergo major and minor changes by the end of this year.

SOFTWARE
e-Mail Software

scheduling, calendaring, or conversation threading. At this writing, prices for the DOS interface modules were expected to range from \$295 to \$395.

As mentioned earlier, sound is becoming a factor in e-mail, and InterActive plans to take full advantage of it in its M-Mail for Windows (\$89 for Version 2.1, \$24.95 for an upgrade) and its DOS e-mail application, which was still unnamed at the time of this writing but set to sell for a list price of \$69. M-Mail can include video e-mail attachments. Version 2.1, scheduled for release later this year, will be fully MHS- and X.400-compatible and is expected to support OLE (Object Linking and Embedding). InterActive also offers SoundXchange hardware (\$149 or \$295, depending on options) that enables you to add sound and voice to e-mail using a telephone-like device. SoundXchange options include a built-in amplifier and microphone, a headset jack, and an optional sound card. The DOS app will also support sound but not video. □

WordPerfect Office, Version 4.0
WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057;
801-225-500; fax, 801-222-5077.

Circle 463 on reader service card

DaVinci eMAIL for Windows, Version 2.01 DaVinci Systems Corp., P.O. Box 17449, Raleigh, NC 27619; 800-328-4624; fax, 919-787-3550.

Circle 464 on reader service card

MailMAN for DOS, Version 1.0

MailMAN 2.0 for Windows

List price: For 10 users, \$495; for 50 users, \$1,495; for unlimited users on NetWare networks, \$2,495.

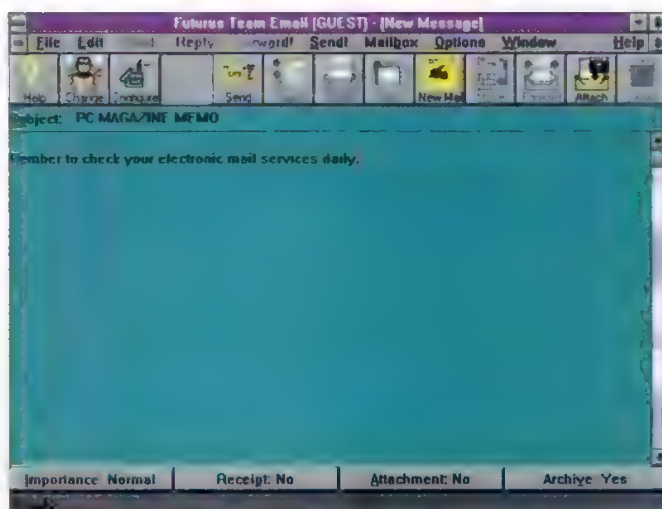
Personal MailMAN, Version 1.0
List price: \$149. Reach Software Corp., 872 Hermosa Dr., Sunnyvale, CA 94086; 800-624-5356; fax, 408-733-0482.

Circle 465 on reader service card

M-Mail for Windows, Version 2.1

InterActive Inc., 204 N. Main, Humboldt, SD 57035; 800-292-2112; fax, 605-363-5102. List price: \$89; upgrade, \$24.95.

Circle 466 on reader service card



The Windows version of Futurus Team gives users options to change, edit, attach, and request a receipt for mail by simply clicking the appropriate icon.

forced to exit their applications every time they want to send e-mail.

Another new e-mail feature in Team is Salvage, which lets you configure Team to automatically archive deleted e-mail messages for retrieval at a later date. The product also allows you to attach up to 64 binary files to a single e-mail message.

Besides the option of sending electronic messages using your favorite DOS application, the Futurus e-mail program is extremely easy to use and works in close conjunction with Team's other features, such as the Enhanced Group Scheduler. This scheduler allows you to attach messages to the notifications of meetings you set up and to check for schedule conflicts. If a group appointment is canceled, Futurus Team notifies all of the participants and the appointment is automatically deleted from the participants' calendars (users are able to block people from accessing their calendars if they wish).

Multiple mailboxes are available for sorting and storing your electronic mail. You can specify where to store your incoming mail and then conduct a search (based on fields such as sender, date, and importance) across all the mailboxes. A pop-up message, a beep, or both auto-

matically alert you to waiting mail or phone messages when you start the program. And you can elect to let the program signal you with a beep as long as the program remains in memory.

Futurus needs to spend some more time on its Windows version and include functions such as DDE (Dynamic Data Exchange), but users will find Futurus Team a pleasure to use.

ADMINISTRATOR

Futurus Team works in conjunction with, but does not require, MHS. Nor does it require memory at the file server, which allows your DOS users to pop it up from a TSR at their workstations. The system administrator installs Team on the file server from a client PC. The installation program creates the needed directory structure for the mail and scheduler programs. If Team finds MHS installed, the installation program will ask you if you want to use MHS as the primary mail system. Otherwise, Team prompts you through the installation with some simple setup questions.

Team provides a utility to migrate the

EXECUTIVE SUMMARY

FROM THE DESKTOP Futurus Team offers everything—a scheduler, notepad, and card-file index. It also has pretty good e-mail functionality.

FROM BEHIND THE GLASS DOOR Adding and maintaining users is easy. But, at the same time, converting the users from the NetWare Bindery is a real pain.

users in NetWare's bindery to the Team mail directory. However, the program requires you to confirm the host directories for each user. This resulted in us having to hit the Enter key 1,500 times (3 times per our 500 users) to enter user names and make the confirmations. We would prefer to see a more automated process like

FACT FILE

Futurus Team DOS/Windows Combo

Futurus Corp., 211 Perimeter Center Pkwy.,
#910, Atlanta, GA 30346; 800-327-8296,
404-392-7979; fax, 404-392-9313



List price: For 5 users, \$495; for additional 25 users, \$1,995, for additional 100 users, \$4,995

Requires: Server: No RAM, 1MB hard disk space. Workstation: 640K RAM, needs no hard disk space. DOS 3.1 or later, Microsoft Windows 3.x for Windows

workstation.

In short: Futurus Team is an easy-to-use e-mail system with many extra utilities. It is a solid mail system with or without MHS. The Windows version may not be where it should be yet, but ingenious features like Universal E-mail may fill the void for the time being.

ON READER SERVICE CARD

those found in WordPerfect Office or cc:Mail.

System administration is simple. You run Team with the user name of GLOBAL and make changes from menus. You can create and edit your user groups merely by selecting and deselecting users from the displayed list. You can even include addresses to other mail systems in your groups.

Team offers two levels of security. The system administrator can use Team's user passwords to protect messages, or can create a directory structure for mail that uses the network operating system's security. Since Team does not do any file encryption, using the NOS's security provides the most secure system. Additionally, the Team documentation explains which access rights are required by files and directories.

Team lacks good management-reporting functions. Unlike cc:Mail, Team does not have a utility to relate the number and status of messages for each user. The system administrator must use a DOS-based utility to query each directory for the number of messages and their size. However, you can limit the amount of disk space each user can have.

The Team Wide Area Network (WAN) option provides real-time multiserver connectivity for NetWare

LANs. With the WAN option, each user can send messages across multiple NetWare servers as transparently as if they were working on a single server. The Team Master Server, which contains the master copy of the address database, replicates the address database for the other servers in a multiserver environment. This, however, requires a NetWare Router with a remote link like a T-1 line or other high-speed connection.

Team features support for remote users with Host software that runs on a dedicated workstation on the network. The Host system waits for calls and forwards incoming mail to the appropriate user while retrieving the calling user's mail.

Creating a remote call-in disk is simple. You simply run the install program, answer a few questions, and copy the address database to the remote disk.

Futurus Team DOS/Windows Combo's strong points are ease of use and detailed documentation. On the system administration side, Team lacks any management reports needed on large corporate mail systems.

Microsoft Corp.

Microsoft Mail for PC Networks

BY RON ANDERSON AND
SALLY BLANNING DEJEAN

With Word for Windows 2.0 and Excel 4.0, Microsoft proved at least one thing—its developers know how to write a Windows interface. Microsoft's \$695 Microsoft Mail for PC Networks, Version 3.0, demonstrates this prowess once again with one of the slickest Windows mail clients available. Users can drag and drop attachments into their message files and link an attachment to its application. The recipient only needs to click on an icon to launch the application and begin working with the file.

Microsoft Mail deserves high marks for its excellent administration utilities and ease of installation. When it comes to straight e-mail management, administrators will love it. But go beyond the basics and the typical administrator may feel uneasy. That's because Microsoft Mail holds the promise of a powerful program that can mail-enable and automatically interact with other Windows-based applica-

tions. In order to harness features beyond e-mail, however, the mail administrator will need to be a programmer or hire the services of one.

END USER

Microsoft Mail presents users with an uncluttered and functional interface. A toolbar is available under the standard menu bar for frequent mail functions. The functions available on the toolbar include Compose, Reply, Reply All, Forward, Move, Delete, Previous, and Next. The toolbar function buttons are selectively grayed-out when they are unavailable.

Pressing the Compose button opens a new message with blank To, CC, and Subject fields that the user simply fills in. The

SUITABILITY TO TASK

Microsoft Mail for PC Networks (Windows edition)

	POOR	FAIR	GOOD	EXCELLENT
Basic messaging	☒	☒	☒	☒
File management	☒	☒	☒	☐
Interprocess communications	☒	☒	☒	☒
Mail server installation	☒	☒	☒	☐
Client installation	☒	☒	☒	☒
Maintenance	☒	☒	☒	☐

Compose window also includes a toolbar with selections to Send, Check Names, Attach Files, Add Options, and Open the Address Book. Pushing the Options button opens a window with check boxes for requesting a return receipt and saving sent mail. Radio buttons control the priority of the message and offer selections for high-priority, normal-priority, and low-priority handling.

A couple of options are available for addressing your mail. Full or partial names can be typed in the To field. Pressing the Check Names button checks the validity of the entered addresses and completes partially entered addresses if possible. If you would rather select names from a list of available addresses, press the Address button. Both the post office address list and your own private address list are available. Typing a name on the keyboard while the address list is open searches the list and places the highlight on the closest approximation available. Addresses can be selected from the list by double-clicking with the mouse or, if you're running Windows 3.1 (which is

► SUMMARY OF FEATURES

LAN-Based E-Mail



Products listed in alphabetical order	BeyondMail for DOS, BeyondMail for Windows	cc:Mail for DOS, cc:Mail for Windows	DaVinci eMAIL for DOS, DaVinci eMAIL for Windows	Futurus Team DOS/Windows Combo	Microsoft Mail for PC Networks	Notework Windows/DOS Combo	WordPerfect Office
☒ = YES ☐ = NO							

Pricing

List price	\$995	\$640	\$295	\$649	\$695	\$698	\$495
Number of users	10	10	10	5	10	10	5

SYSTEM ADMINISTRATOR FEATURES

General Features

Includes 5.25-inch and 3.5-inch floppy disks in the same package	☐	☒	☒	☐	☒	☐	☐
Mouse support	☒	☒	☒ (Windows version only)	☒	☒	☒ (Windows version only)	☐
Can define mailboxes on local disks	☒	☐	☒	☐	☒	☐	☐
Reads NetWare Bindery	☒	☒	☒	☒	☐	☒	☒
Runs with NetBIOS LANs	☒	☒	☒	☒	☒	☐	☒
E-mail log-on separate from network log-on	☒	☒	☒	☒	☒	☒	☒
Notifies user of incoming mail	☒	☒	☒	☒	☒	☒	☒
Notifier is a TSR	☒	☒	☒	☒	☒	☒ (DOS version only)	☒
User can disable notification	☒	☒	☒	☒	☒	☒	☒

Message Management

Administrator can:							
Read all messages	☐	☐	☐	☒	☒	☒	☐
Change user passwords	☒	☒	☒	☒	☒	☐	☒
Use default user profile	☒	☒	☒	☒	☒	☒	☒
Delete outdated mail	☒	☒	☒	☒	☒	☒	☒
Limit space in old mail files	☐	☒	☐	☐	☒	☐	☐
Set up subject bulletin boards	☒	☒	☐	☒	☒	☐	☐

Security

User can arrange for assistant to pick up recipient's messages	☒	☒	☒	☒	☒	☐	☐
User can arrange for private messages only recipient can read	☒	☐	☒	☒	☒	☐	☒
Messages can be password-protected	☒	☐	☒	☐	☐	☐	☐
User can encrypt messages	☒	☒	☒	☐	☒	☐	☒

Gateways

Supports MHS	☒	☒	☒	☒	☒	☒	☒
MHS gateway available as an option	☐	☒	☐	☐	☒	☒	☒
Separate gateways available from vendor for:							
AT&T Mail	☐	☒	☐	☐	☐	☒	☒
CompuServe	☐	☐	☐	☐	☐	☐	☐
DEC All-in-One	☐	☐	☐	☐	☐	☐	☐
DEC VMS Mail	☐	☐	☐	☐	☐	☐	☐
HP Desk	☐	☐	☐	☐	☐	☐	☐
IBM DISOSS	☐	☐	☐	☐	☐	☐	☒
IBM PROFS	☐	☒	☐	☐	☒	☐	☒
MCI Mail	☐	☒	☐	☒	☒	☒	☒
Wang Mailway	☐	☐	☐	☐	☐	☐	☐

CONTINUES

► SUMMARY OF FEATURES

Products listed in alphabetical order

■ = YES □ = NO



	BeyondMail for DOS, BeyondMail for Windows	cc:Mail for DOS, cc:Mail for Windows	DaVinci eMAIL for DOS, DaVinci eMAIL for Windows	Futurus Team DOS/Windows Combo	Microsoft Mail for PC Networks	Notework Windows/DOS Combo	WordPerfect Office
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Gateways (continued)

X.400	□	□	□	□	■	□	■
Others	None	SMTP, UUCP	SMTP	None	SMTP, SNADS, 3+MAIL	UUCP	None
User can mix local and foreign addresses in same message	■	■	■	■	■	■	■

Other Platforms

Supports OS/2 workstations	□	■	■	□	■	□	□
Supports Macintosh workstations	□	■	■	□	■	□	■
Supports VAX workstations	□	□	□	□	□	□	■
Supports Unix workstations	□	■	□	□	□	□	■

Modules

Remote module for logging on via modem	Optional	Optional	Optional	Optional	Optional	Optional	■
Send-fax module	□	Optional	Optional	■	Optional	Optional	■
Viewer for incoming faxes	□	■	■	■	■	□	□

Product Support

Demo disk available	■	■	■	■	■	■	■
Unlimited free support	■	■	■	■	■	■	■
Additional support available for a cost	■	■	□	□	■	□	□
Toll-free support	■	□	■	■	□	■	■

END USER FEATURES

Editing Functions

Maximum number of lines in message	800	312	1,024	640	504	255	Unlimited
User can move blocks	■	■	■	■	■	□	■
User can import ASCII files	■	■	■	■	■	■	■
User can see files in directories	■	■	■	□	■	□	■
User can select files with cursor	■	(Windows version only)	■	□	■	□	■
Includes text editor	■	■	■	□	■	■	■
Shows boldface text	■	□	□	N/A	(DOS version only)	□	■
Shows underlined text	■	□	□	N/A	□	□	■

Attaching Binary Files

User can see files in directories	■	■	■	■	■	□	■
User can select files with cursor	■	■	■	■	■	□	■
Maximum number of attachments	64	20	Unlimited	64	Unlimited	Unlimited	100
Maximum size of attachments	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	32MB	Unlimited
Can encrypt attachments	□	■	■	□	■	□	■
Can save received attachments to disk	■	■	■	■	■	■	■

Addressing, Organizing, and Searching

User can select addressees from directory	■	■	■	■	■	■	■
Directory shows location or department	■	■	■	■	■	□	■
User can create and edit mailing lists	■	■	■	■	■	■	■
User can import mailing lists	■	■	■	■	□	■	□
User can assign priorities	■	■	■	■	■	■	■
User can store and sort received mail	■	■	■	■	■	■	■

N/A—Not applicable. The product does not have this feature.

CONTINUES



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The new ZEOS®/SL. Read all about it!



Digital brightness and contrast buttons make screen adjustment so easy.

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an external VGA color monitor for simultaneous display. Now that's what people want! But that's not all.

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Can't someone design a notebook keyboard to be like a desktop keyboard? And while you're at it, be sure to include a pointing device that's easy to use, with three click keys. And how about making sure those cursor keys are *full size* and in the inverted-T format. And all the keys should have good travel and that "just right" ergonomic feel. That was the keyboard wish list.

So we designed it. From scratch. Every key was re-designed and re-sculpted. Even the key-switch mechanism was invented anew. And we added the mouse key for easy cursor control. It is the absolute perfect notebook keyboard. What else?

Lots else! Like the best display system of any notebook available anywhere. We listened here too. The screen is big and easy to read. Plus, it's high contrast and it's fast. It's also very easy to adjust. People said contrast and brightness knobs were hard to use. So we replaced them with soft touch buttons that *electronically* adjust screen settings at your command. Then we really got creative.

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This comes in handy in other ways as well. It's easy to share data with a person sitting next to you by turning the screen; or if privacy is in order, turn it away so only you can see it. Every frequent flier will appreciate that!



IT FLOATS TOO!

And then there is the "floating" screen. When you're facing your new ZEOS Freestyle/SL, the screen actually appears to "float" in the air in front of you. Adjustable over a wide range of angles, it's the only notebook that can really be used sitting on your lap! Back to our frequent fliers. Because the screen floats on a smaller footprint than normally

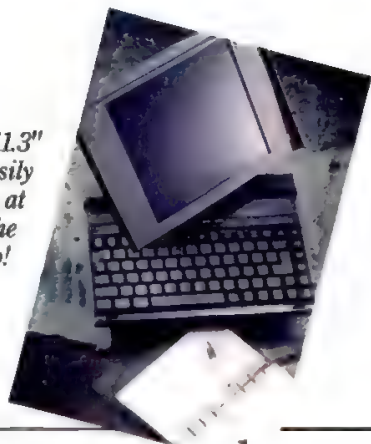
hinged screens, you can also use the ZEOS Freestyle/SL without fear of the person in front of you cranking their seat back and doing a "screen crunch" on your system.

Reliability is truly designed in from the ground up in your ZEOS Freestyle/SL. Right down to the port access door. People told us that one of their pet peeves was port access doors falling off competitors' notebooks. Not a problem here. Your industry standard serial, parallel and VGA port connectors are protected by an ingenious sliding door that won't ever fall off.

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wallop of a desktop!*



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ZEOS.

#1 RATED NOTEBOOKS, SERVICE & SUPPORT!

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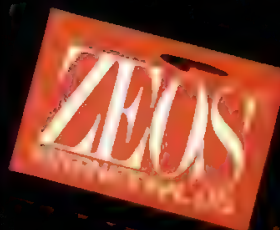
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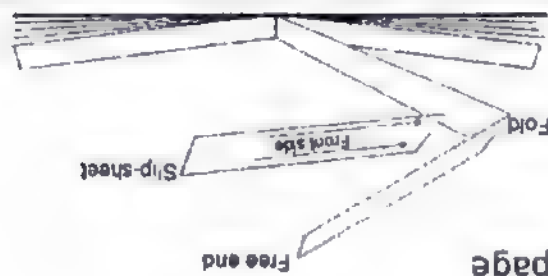
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More features at a
lower cost than any
other notebook.

Period.



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet



GbsSlipSheet-001

Folded edge of the page

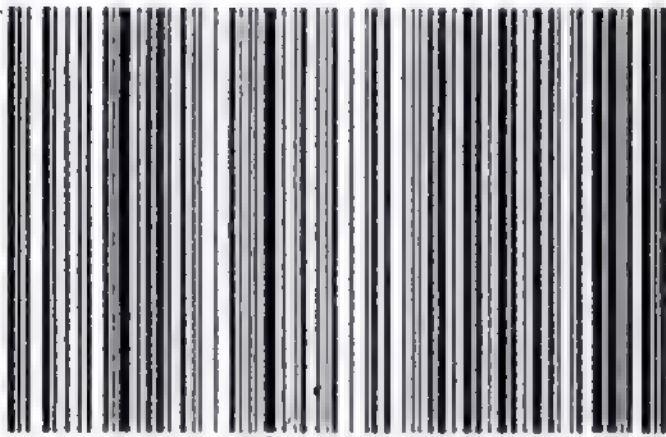
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-0018

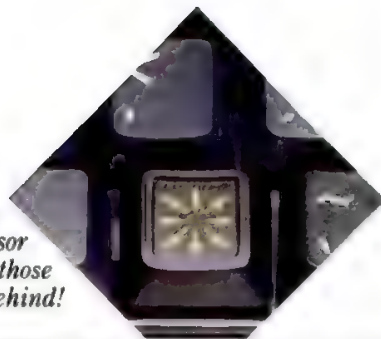
Back

1. Follow instructions on the other side

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Easily adjusts for
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*Built-in mouse key
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To try and compare the new ZEOS Freestyle/SL to any other notebook on the market is next to impossible. Because nothing else has all its features. And even with all these great features, nobody can match the price. Features and price. It would seem the new ZEOS Freestyle/SL is the best of all worlds. It is.

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The first thing people told us is that most notebooks look like a cigar box with a lid. They told us they wanted more. Not only good looks, but things like great power *and* great battery life. Lightweight too, like five pounds and change. And the display had to be both crystal-clear as well as functional. And the keyboard should be effortless to use. The entire product had to be extremely durable. And that was just for starters.

SL POWER. SL BATTERY LIFE!

We listened well. Then we got down to work. For the chipset and CPU we selected

the Intel 25MHz SL. We then built in a high-speed 64K SRAM cache as standard. We know this system might well replace a desktop for many users.

PC Magazine said the SL chipset is "the way to go" and we agree. The ZEOS Freestyle/SL incorporates the very latest in power-saving features. You can easily go in and out of the various power-saving modes automatically as well as use our "Windows Safe" suspend/resume feature. In addition, the ZEOS/SL features *flash BIOS* enabling you to easily update your BIOS in the future via diskette or modem.

Power to your ZEOS Freestyle/SL system is provided by our advanced battery system. The fully enclosed lightweight battery packs easily snap in and out and can be quick-charged when the system is not being used or trickle-charged when in use. An optional charging stand is also available. You're also going to like our super-small AC adapter—it can fit in a shirt pocket and weighs only ounces. So what happens when the power is on?

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- PC Magazine,
Service and Reliability issue,
May 26, 1992

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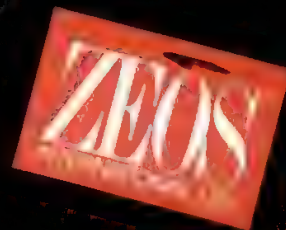
**Future
likelihood of
buying from
the vendor**



**Satisfaction
with repair service**



**Satisfaction
with technical
support**



► SUMMARY OF FEATURES

Products listed in alphabetical order ■ = YES □ = NO		BeyondMail for DOS, BeyondMail for Windows	cc:Mail for DOS, cc:Mail for Windows	DaVinci eMAIL for DOS, DaVinci eMAIL for Windows	Futurus Team DOS/Windows Combo	Microsoft Mail for PC Networks	Network Windows/DOS Combo	WordPerfect Office
Addressing, Organizing, and Searching (continued)								
User can establish message threads linked by:								
Date	■	■	■	□	□	■	■	■
Recipient	■	■	■	□	■	■	■	□
Topic	■	■	■	□	■	■	■	□
User can set up topic folders	■	■	■	■	■	■	□	■
User can search received mail by:								
Date	■	□	■	■	□	■	■	■
Message text	■	■	□	■ (DOS version only)	■	■	■	■
Sender	■	■	■	■	■	■	■	■
Topic	■	■	■	■	■	■	■	■
Other		Attachment, carbon and blind carbon copies	Priority	Carbon and blind carbon copies, class, priority	None	Recipient	Notes, priority, recipient, time	None
Documentation and Help								
Summary cards	■	■	■	■	□	■	■	■
Tutorial	■	□	■	□	■	■	■	■
Index in user manual	■	■	■	■	■	■	■	■
On-screen diagrams or examples	■	■	■	□	■	■	■	□
Context-sensitive help	■	■	■	□	■	■	□	■
Pop-up help windows	■	■	■	■	■	■	□	■
Manual for each user	□	■	□	□	□	□	■	□

ENDS

highly recommended), by dragging and dropping the selected names into the To or CC fields.

The drag-and-drop functionality of Windows 3.1 is exploited admirably by Microsoft Mail. Attaching files to a mail message is simple: Select the file or files from the File Manager, then drag and drop them in an open message where they will appear in the body of your message as icons. If the attached file's extension is associated with a Windows application, the icon reflects the associated application's icon. Because the icons representing the attached files are part of the message's text, you can refer to them directly in the message and place the icon next to the reference. All the receiver of your message need do is double-click on the attachment's icon and the associated application is launched with the attachment open.

Message maintenance is another area of Microsoft Mail that makes use of the Window's 3.1 drag-and-drop facility.

Messages can be moved into folders and folders can be placed in other folders by dragging and dropping their icons. Deleting a message is as simple as dragging its icon to the Wastebasket folder. The

*For straight e-mail
administration, Microsoft
Mail could usually be
managed by someone
who is not technically
sophisticated.*

Wastebasket folder along with Inbox, Outbox, and Sent Mail folders are standard items on the mail desktop. You can optionally set Microsoft Mail to delete messages in the Wastebasket upon exiting the mail program, or you can choose to

manually delete mail.

The message finder searches your folders for a single message or groups of messages. The finder can search by sender, subject, recipients, or by text in the message. Date searches are not possible. You can constrain the finder to a single folder or let it search all of your folders.

Microsoft Mail includes context-sensitive help and on-line tutorials that make user manuals all but unnecessary. Help includes a table of contents and an index. The index makes tutorials on particular entries available at the click of a button. When you access the on-line tutorial directly, it guides you through a series of structured lessons designed to get the novice mail user up to speed quickly.

If you switch back and forth between multiple operating systems, Microsoft Mail has you covered. Clients are available for DOS, Windows, OS/2's Presentation Manager, and the Macintosh. Since these clients share the same mail data-

SOFTWARE

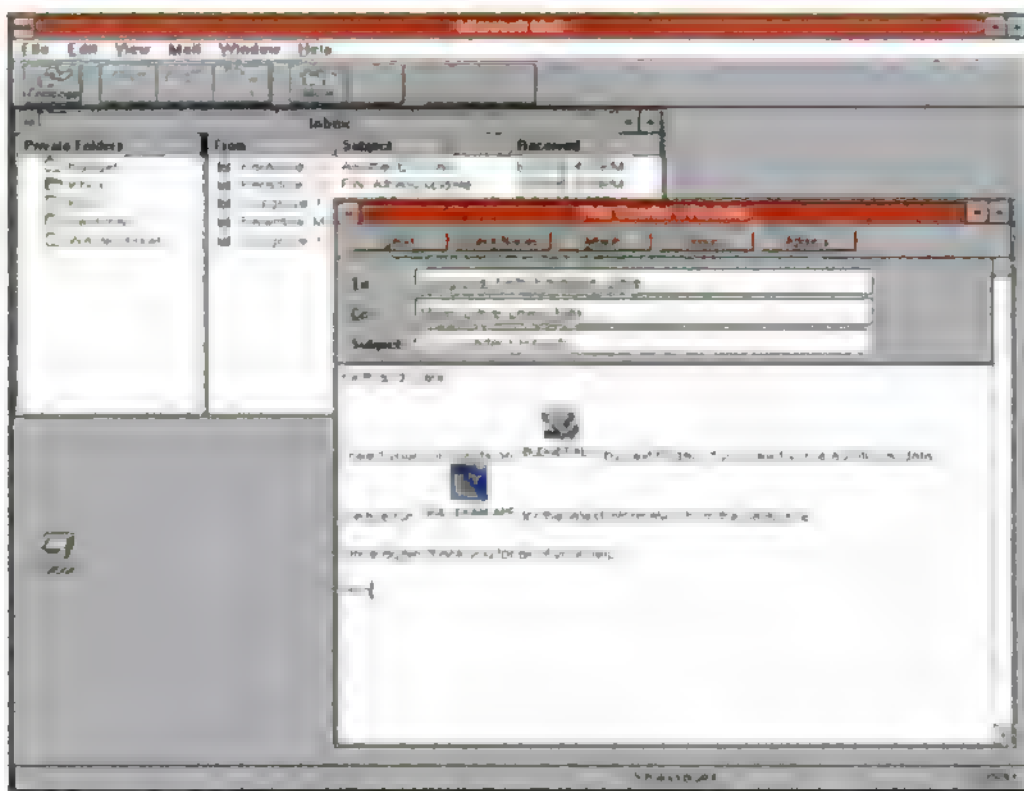
e-Mail Software

base, switching from one operating system to another during the day will not cause you problems (at least as far as mail is concerned).

With this release, Microsoft has implemented its Messaging Application Programming Interface (MAPI). Users who are in need of scheduling software that will work with their mail will benefit from MAPI immediately with Microsoft Schedule+. This is an add-on product that

provides individual and group scheduling. Since MAPI is an open specification, you can also expect third-party software developers to write additional workgroup applications that integrate with Microsoft Mail.

Microsoft Mail is a strategic application within the Microsoft family of applications and is positioned as the cornerstone of present and future workgroup applications. If Microsoft products and di-



Microsoft Mail for PC Networks allows users to launch the applications associated with message attachments by simply clicking on the attachment's icon.

run programs from DOS with switches and syntax that might overwhelm nontechnical people.

While many e-mail programs provide administrators with several different, cryptically named program files to maintain the system, Microsoft has put everything in one menu-driven administration program that is clearly organized and easy to use. Furthermore, the disks and instructions for the server and clients (for

every operating system) come in one package. Only gateway products are sold separately.

The installation of the server and client software, both under DOS and Windows, proceeded without a hitch, and we had no need to call techni-

cal support for help. Of the products we reviewed, Microsoft Mail presented one of the best integrations of DOS and Windows clients. The products of some other e-mail vendors that have not been upgrading DOS and Windows concurrently are out of sync, with the newer versions boasting better features than the older. Microsoft has largely avoided that problem, although some features—such as OLE (Object Linking and Embedding) and the toolbar—are only available in Windows. But these differences barely af-

fect administration of e-mail. The manual clearly points out the few utilities that are for one platform only.

Microsoft Mail provides its own utilities for printing usage reports, deleting old mail, and compressing mail files to save space. But there is no utility to enter Mail users in batch mode. Each must be entered manually. This is a very annoying omission, especially for administrators who convert from other programs or Novell users who want to take names from the NetWare bindery. Most other e-mail programs provide a way to batch-process new users.

The Admin program is the heart of Microsoft Mail's administration. It is particularly good at easing the administrator's job of synchronizing the address books of different servers, setting up remote users, recovering disk space, deleting old files, and assigning user-access and folder privileges. The menus lead the administrator through step by step, and on-line context-sensitive help is always available. For troubleshooting, administrators

EXECUTIVE SUMMARY

FROM THE DESKTOP One of the nicest things about Microsoft Mail is that if you know how to click and drag, then you can attach, send, and look at files.

FROM BEHIND THE GLASS DOOR This product provides comprehensive, centralized, well-organized, administration. It would be even better if its programming were easier to use.

rections are important to you or if you're looking for an easy-to-use, full-featured electronic mail system, then do yourself a favor and take a long look at Microsoft Mail for PC Networks.

ADMINISTRATOR

For straight e-mail administration, Microsoft Mail's interface has been so well designed that it could usually be managed (once properly installed and configured) by someone who is not technically sophisticated; it does not require the manager to

FACT FILE

EDITORS' CHOICE

Microsoft Mail for PC Networks, Version 3.0

Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080; fax, 206-883-8101



List price: For server and 10 users, \$695; for additional 5 users, \$395; for additional 20 users, \$1,349; for additional 100 users, \$5,500; for additional 500 users, \$22,500.

Requires: Server: No RAM (640K to run Message Transfer Service),

3.5MB hard disk space. DOS workstation: 512K RAM, no hard disk space. Microsoft Windows workstation: 2MB RAM, 1MB hard disk space, Windows 3.x. OS/2 workstation, 4MB RAM (8MB recommended), 1.3MB hard disk space, OS/2 1.2 or 1.3. DOS 3.1 or later.

In short: Excellent administration utilities, easy installation, and abundant e-mail features mark Microsoft Corp.'s latest release of Microsoft Mail for PC Networks. It is strategically positioned in the Microsoft family of applications and easily integrates DOS and Windows client bases. Administrators should be aware of some shortcomings in security and customization tools, however.

ON READER SERVICE CARD

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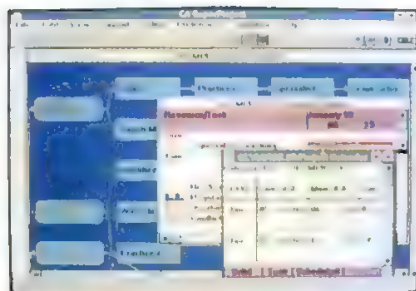
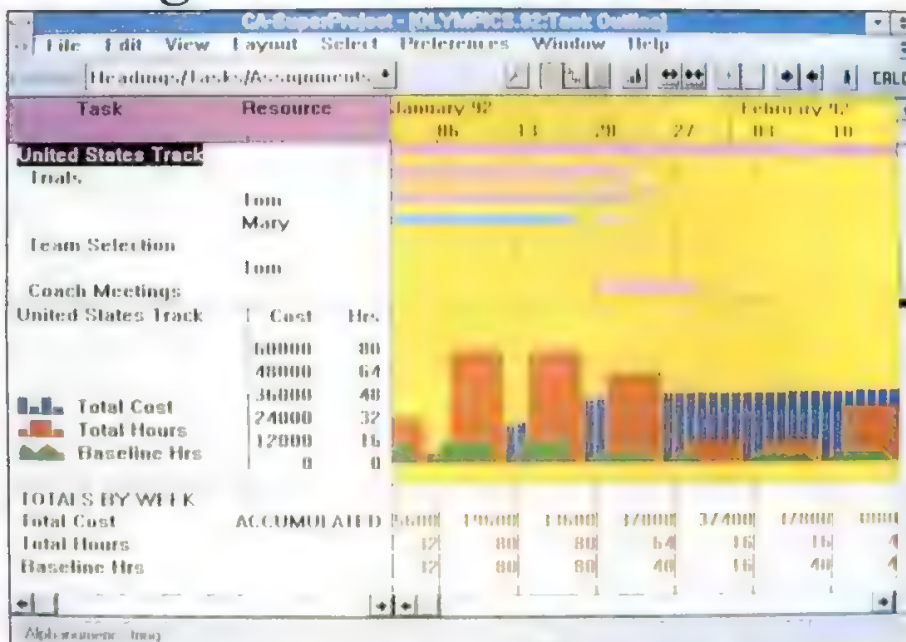


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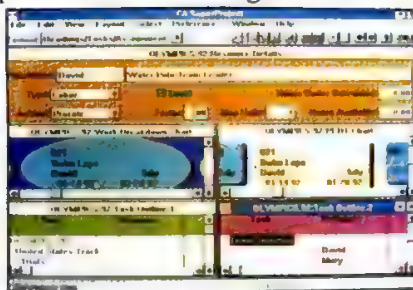
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ing days—leaving Microsoft Project, Timeline 4.0, Project Workbench and Project Scheduler in the dust.

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may use any of a series of log files to track all activity.

Microsoft Mail's answer to a bulletin board is shared and group folders. A mail user has to be the member of a particular group to access that group's folder, but anyone with access rights to shared folders may access those. Administrators set up access rights when they create users, and it is easy to modify them at any time. Administrators and users can set up folders, but those the administrator creates through the Admin program are listed in the Public Post Office Address List. (Folders users create appear in their Personal Address List.)

The security aspect of Microsoft Mail has a few weaknesses. The administrator is able to reset a user's password back to a default of "password" and can then access the user's mail. Administrators who deal with forgetful users will like this feature, but in a high-security environment it's a drawback. The mail files are encrypted on the LAN. Security is even tighter on LAN MAN networks because Microsoft is able to use a security feature that hides the location of mail data files from users.

Although Microsoft Mail has a lot going for it as an e-mail program, it will distinguish itself by its ability to integrate its e-mail into the total work flow process of an organization. To do that, most organizations will need the services of experienced programmers. It is disappointing that Microsoft, which did such a good job of providing e-mail administration tools that do not require a lot of technical sophistication on the part of the administrator, did not bring some of the customization tools to the programming level. Despite this, Microsoft Mail still ranks as the most integrated, the most powerful, and the easiest to use e-mail package in its class.

Notework Corp.

Notework Windows/DOS Combo

BY RON ANDERSON AND
SALLY BLANNING DEJEAN

Notework Windows/DOS Combo, Notework Corp.'s \$698 e-mail program, is apt to make an e-mail administrator feel like the Maytag repairman: Notework installs quickly and requires little maintenance.

Although it lacks many of the features you'll find in other programs reviewed here, it is kind to end users. The "combo" referred to in the product name is actually Notework for DOS, Version

SUITABILITY TO TASK				
Notework for Windows				
	POOR	FAIR	GOOD	EXCELLENT
Basic messaging	☒	☒	☐	☐
File management	N/A			
Interprocess communications	☒	☒	☐	☐
Mail server installation	☒	☒	☒	☐
Client installation	☒	☒	☒	☐
Maintenance	☒	☐	☐	☐

1.25, combined with Microsoft Windows capabilities.

Notework requires little training. A user can master it in less than 30 minutes and, because both its DOS and Windows interfaces are nearly identical, an administrator can teach it to users on both platforms in about the same amount of time.

Notework is a 5K TSR program that can pop up over any application, allowing users to deal with mail and messages without interrupting work in progress. It's also easy to oversee. Once it is correctly installed, even someone who barely understands NetWare can manage it.

END USER

While the Windows client is a separate executable, it is still a character-based program. If you're using a Novell network and want an easy-to-learn e-mail package for both DOS and Windows clients, then look no further—Notework is here. In keeping with the design goals of this package, Notework's main menu is simple and intuitive.

Available options include sending and opening electronic mail, resuming work on previous drafts, broadcasting messages to all users on a single server or systemwide, setting optional parameters, and recovering

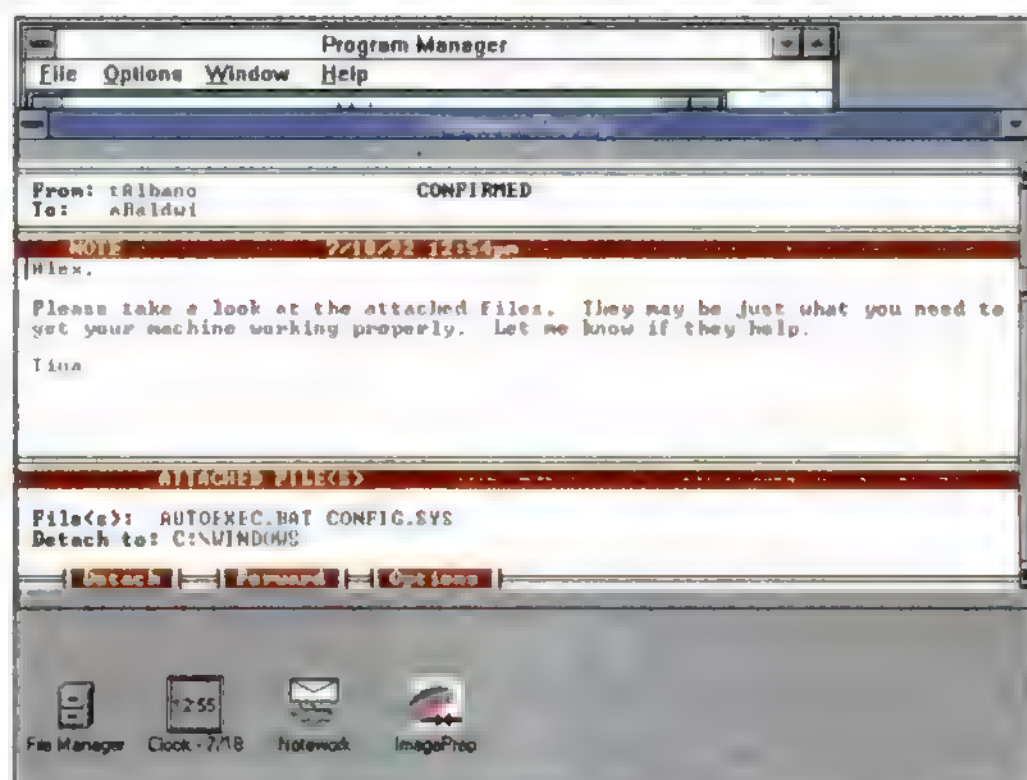
deleted mail from the trash. The e-mail administrator determines the length of time deleted messages are available for recovery.

Notework takes a different tack with DOS and Windows clients, a tack that might not be appropriate for everyone. The Notework DOS client notifies you of new mail by sounding a tone, then placing a flashing symbol in the upper-right-hand corner of your screen. For Windows users, the notification symbol is placed on the Notework icon. The symbol identifies the type of mail you have received and remains visible until you activate Notework with the hotkey.

The default hotkey combination is Alt-Tab and can be changed easily. In fact, in the Windows environment that combination is already used to switch between applications, so we changed the hotkey to Ctrl-F1. When activated, a small box that contains the Notework main menu appears on-screen.

Users selecting the Send Message command are presented with an address pick list followed by a form pick list. Selections from the address list are made by scrolling the list with the arrow keys until the desired name appears, or by positioning the highlight directly by pressing the letter key that corresponds to the first capitalized letter in the addressee's name. Multiple addressees are selected from the address pick list by tagging the desired names.

The form's pick list includes selections for Flash, Phone Call, Note, Urgent Note, and Wide Note. The Flash form is a mes-



The Windows version of Notework presents users with windows in which to enter addresses, text, and attachments.

sage form that pops up on the receiver's screen no matter what they are doing at the time and announces phone calls. The Flash form provides an excellent method of dealing with the immediacy of someone waiting on the phone. When executing a flash, the operator fills in the caller's name, company, the phone line if applicable, and a brief message if desired. On the Notework user's screen, the flash message pops up with the information entered by the operator and presents the user with five options: Answering, Hold, Will Call, Unavailable, and Reply. Selecting any of the first four options automatically sends the appropriate response to the operator. If the user does not respond, the Flash form returns to the operator as a Phone Message form that can be completed and sent to the user for review at his or her leisure. If you would rather not be interrupted by a Flash, you can turn this option off using the Parameters Setup option of the main menu.

Notework's main menu can be customized to include executable macros that users create to automate often-repeated messaging tasks. For example, you could add menu items for flashing messages to your coworkers if you receive calls for them on a regular basis. Unwanted main menu items can be deleted. The Parameters Setup option provides for additional customization. Mail alerts can be switched on or off, default directories can be entered, and animation can be turned off or on. Animation defaults to on, so

other mail packages in this review are noticeably absent from Notework. Notable omissions include message-management features like folders and archiving. Also, the Windows client is best thought of as a graphical representation of the DOS client rather than as a Windows program. The only real difference between the DOS and Windows clients is that users of the Windows version can select menu options with a mouse. Notework Corp. maintains that this similarity is an asset—users who switch between the two environments don't need to relearn anything. Users who expect a true Windows client, however, may be disappointed.

ADMINISTRATOR

It's difficult for an administrator who likes to solve problems to get excited about Notework, because it is a user's program that requires little training. Notework offers few of the powerful features found in the other e-mail programs we tested, but it does a good job on the design and implementation of the features it does provide.

Notework would be a poor choice for a company that needs tight security. It relies on Novell's NetWare for its protection. All mail files must stay on the server, not on one's local machine, and there is no way to direct messages into folders or separate directories. Users can, however, save all messages to an ASCII file and use a Notework utility to search that file for strings of text. Again, responsibility for

managing the file and keeping it to a reasonable size falls to the user, not the administrator. Many administrators prefer not to tell users of this option.

Once the program is installed on the server, users need only reboot

to use Notework. From then on, unless an organization wants systemwide changes to the menu structure that pops up when a user accesses Notework, end users can handle most of the maintenance. A 5K TSR runs on the workstation. Users who wish to modify their individual Notework menus may do so with the easy-to-use

FACT FILE

Notework Windows/DOS Combo

Notework Corp., 72 Kent St., Brookline,
MA 02146; 800-767-6683, 617-734-4317;
fax, 617-734-4160



List price: For server and 10 users, \$698; for additional 20 users, \$1,197; for additional 30 users, \$1,797; for additional 50 users, \$2,249; for additional 100 users, \$4,349; for additional 250 users, \$10,499.

Requires: Server: No RAM, 500K hard disk space. Workstation: 5K RAM, no hard disk space. DOS 3.1 or later, Microsoft Windows 3.x for Windows workstation.

In short: Notework is a messaging system that works well in organizations where users need ease of use and want to handle simple kinds of messages, but it is in a different league from the other e-mail programs we tested. It lacks their file-handling capabilities, security, utilities, and flexibility. From an administrative point of view, this program requires little time to maintain or install. It would be good for an organization that had no MIS (management information systems) department.

ON READER SERVICE CARD

EXECUTIVE SUMMARY

FROM THE DESKTOP Notework's goal is simplicity, but inherent in that goal is the inability to perform some advanced tasks.

FROM BEHIND THE GLASS DOOR An administrator doesn't need to know a lot about NetWare to maintain Notework. Its management tools are limited but easy to use.

don't be surprised when you send a message and a jet grabs your envelope and zips off the screen. The mail editor can also be configured to resemble some popular word processing editors including WordPerfect, Microsoft Word, MultiMate, and WordStar.

Some features that are included in

menu-driven setup program.

Notework is designed for Novell networks only. When an administrator installs Notework on a self-contained LAN, it's not even necessary to install MHS. It uses the mailboxes Novell's NetWare creates for the LAN users and routes messages on the LAN. Administrators install MHS for remote calls or for connectivity to other e-mail systems, in which case Notework sells its own MHS gateway. Even the MHS gateway is designed for low maintenance. It dynamically creates a personal address book (or Pick List) for each user made up of the last 250 users called, and it records the e-mail addresses of incoming mail. There's no need for Notework users to feel isolated, since the company offers a large number of gateway products to other e-mail systems and to fax.

PC Labs's installation was not flawless, and the administrator had a couple of problems to solve. During installation, we chose to allow Notework to put the command line to load the TSR into each user's personal NetWare login script. It caused

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	DELL DIMENSION	COMPAQ PROLINEA	AST BRAVO	IBM PS/2
Model	386SX/25	3/25zs Mod 84	3/25s Mod 83B	355X
Microprocessor	i386™SX 25 MHz	i386SX 25 MHz	Am386SX 25 MHz	i386SX 20 MHz
RAM	4 MB	4 MB	2 MB	2 MB
Hard Disk Drive	80 MB	84 MB	80 MB	80 MB
Drive Bays	3	2	4	3
Expansion Slots	4	2	5	2
Monitor	Dell Super VGA 1024I (14", 1024 x 768, .28mm, interlaced)	Compaq VGA Color Monitor (14", 640 x 480, .31mm)	AST Super VGA Monitor (14", 1024 x 768, .28mm, interlaced)	IBM PS/2 8512 Color Display (14", 640 x 480, .41mm)
Software/ Operating System	Microsoft® Windows™ 3.1 MS-DOS® 5.0	Microsoft Windows 3.1 MS-DOS 5.0 PFS: WindowsWorks	Microsoft Windows 3.1 MS-DOS 5.0	NONE
SERVICE:				
Technical Support	Lifetime toll-free automated Technical Support 1-year ExpertHelp hotline	Lifetime toll-free technical support	Lifetime toll-free technical support	Lifetime toll-free technical support
On-Site Service Contract Included	2nd Business Day ^A	2nd Business Day	NO	NO
FAX Support	YES	YES	YES	YES
Bulletin Board	YES	NO	YES	YES
Price	\$1,349	\$1,623**	\$1,695**	\$2,235**

Dealer prices may vary.

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x 768, .28mm), MS-DOS 5.0/
Microsoft Windows 3.1/Mouse

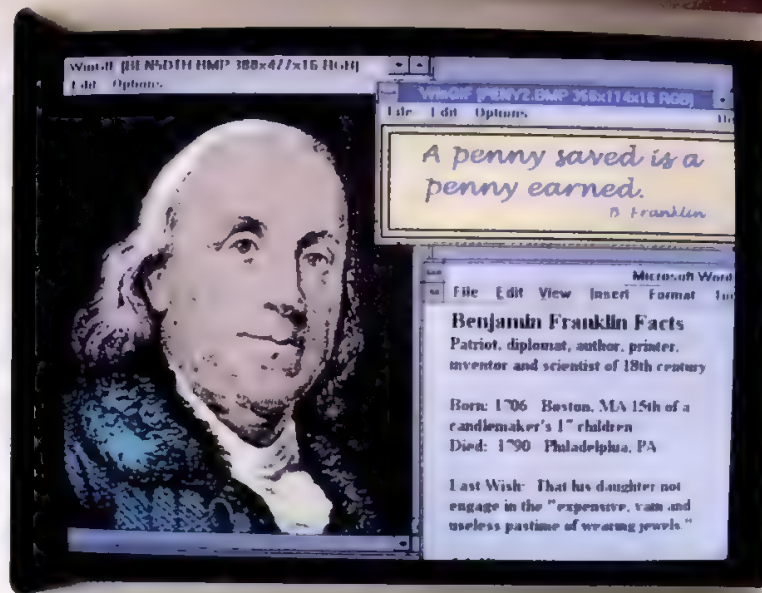
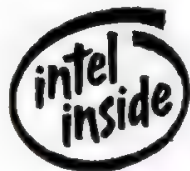
**DIMENSION
486DX/33**

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Lease*: \$85/MO.

i486DX 33 MHz System, 4 MB RAM,
212 MB Hard Drive, 5 Drive Bays, 6 Expansion
Slots, 64 KB Cache, Dual Floppy Drives (3.5" and
5.25"), Ultra VGA 1024NI Monitor
(14" 1024 x 768, .28mm),
MS-DOS 5.0/Microsoft
Windows 3.1/Mouse

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DIMENSION 486SX/25s \$2,199

Lease: \$81/MO.

i486SX 25 MHz System
4 MB RAM, 212 MB Hard Drive,
6 Drive Bays, 6 Expansion Slots,
Dual Floppy Drives (3.5" and
5.25"), Ultra VGA 1024NI Monitor
(14", 1024 x 768, .28mm),
MS-DOS 5.0/Microsoft
Windows 3.1/Mouse

DIMENSION 486DX/33s \$2,699

Lease: \$100/MO.

i486DX 33 MHz System
8 MB RAM, 212 MB Hard Drive,
6 Drive Bays, 6 Expansion Slots,
64 KB Cache, Dual Floppy Drives
(3.5" and 5.25"), Ultra VGA
1024NI Monitor (14", 1024
x 768, .28mm), MS-DOS 5.0/
Microsoft Windows 3.1/Mouse



DIMENSION 386SX/25 \$1,259

Lease: \$47/MO.

i386SX 25 MHz System
2 MB RAM, 80 MB Hard Drive,
3 Drive Bays, 4 Expansion Slots,
Dual Floppy Drives (3.5" and
5.25"), Super VGA 1024I Monitor
(14", 1024 x 768, .28mm),
MS-DOS 5.0/Microsoft
Windows 3.1/Mouse

DIMENSION 386SX/25 \$1,449

Lease: \$54/MO.

i386SX 25 MHz System
4 MB RAM, 120 MB Hard Drive,
3 Drive Bays, 4 Expansion Slots,
Dual Floppy Drives (3.5" and
5.25"), Super VGA 1024I Monitor
(14", 1024 x 768, .28mm),
MS-DOS 5.0/Microsoft
Windows 3.1/Mouse



DIMENSION NL20 \$1,399

Lease: \$52/MO.

i386SL 20 MHz System*
2 MB RAM, 40 MB Hard Drive,
Weight: 6.3 lbs. including battery,
Minimum battery life: 2.5 hours,
Edgelit VGA LCD (8.5" Diagonal,
640 x 480), MS-DOS 5.0

DIMENSION NL25 \$1,699

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i386SL 25 MHz System*
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(9.5" Diagonal, 640 x 480),
MS-DOS 5.0

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	DELL DIMENSION	COMPAQ PROLINEA	AST BRAVO	IBM PS/2
Model	486DX/33	4/33 Mod 120	4/33 Mod 838	40SX-045
Microprocessor	i486DX 33 MHz	i486DX 33 MHz	i486DX 33 MHz	i386SX 20 MHz
RAM	4 MB	4 MB	4 MB	4 MB
Hard Disk Drive	170 MB	120 MB	80 MB	80 MB
Drive Bays	5	3	4	4
Expansion Slots	6	3	5	5
External Cache	64K	0	0	0
Monitor	Dell Super VGA 1024I (14", 1024 x 768, .28mm, interlaced)	Compaq VGA (14", 640 x 480, .31mm)	AST Super VGA Monitor (14", 1024 x 768, .28mm, interlaced)	IBM PS/2 8518 Color Display (14", 640 x 480, .28mm)
Software/ Operating System	Microsoft Windows 3.1 MS-DOS 5.0	Microsoft Windows 3.1 MS-DOS 5.0 PFS: WindowWorks	Microsoft Windows 3.1 MS-DOS 5.0	NONE
SERVICE: Technical Support	Lifetime toll-free automated Technical Support 1-year ExpertHelp hotline	Lifetime toll-free technical support	Lifetime toll-free technical support	Lifetime toll-free technical support
On-Site Service Contract Included	2nd Business Day	2nd Business Day NO		NO
FAX Support	YES	YES	YES	YES
Bulletin Board	YES	NO	YES	YES
Price	\$2,099	\$2,493**	\$2,455**	\$2,745**

Dealer prices may vary.

**Sources: Compaq price list as of 6/15/92, AST price release as of 7/27/92, IBM price list as of 7/21/92. *Service provided by BancTec Service Corporation. On-site service may not be available in certain remote locations. †Leasing arranged by Leasing Group, Inc. i386, i486 and the Intel Inside Logo are trademarks of Intel Corporation. MS-DOS and Microsoft are registered trademarks and Windows is a trademark of Microsoft Corporation. FORTUNE 500 is a registered trademark of The Time Inc. Magazine Company. Dell disclaims proprietary interest in the marks and names of others. ©1992 Dell Computer Corporation. All rights reserved.

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users to lose their drive mappings, and required a change to the system login script.

As a result of a NetWare limitation, Network also hit a snag when we tried to add more than 250 users. We were forced to deceive NetWare and set up a "pseudoserver," or a second installation on the host. Though not a difficult workaround, it was annoying.

Network's best feature is its menu-driven NWSYSCON program, where Network administration occurs. A clear, well-defined series of screens allows the administrator to select names from the bindery for addition to Network. Although it is also possible to add everyone's name at once to Network's e-mail, being able to select the users individually is practical for organizations that want to implement Network gradually or to limited groups. Network adds users in increments of 10, 20, 50, or 1,000. We added them in increments of 50. Two disks are required when installing Network for Windows—Network's user disk and its Windows disk. The latter is required if Network is represented as an icon in Windows.

From an administrative point of view, Network is ideal for organizations where a regular employee doubles as network manager, and where the demands for e-mail are basically notification and messaging. Once installed it requires little support or maintenance.

WordPerfect Corp. **WordPerfect Office**

**BY STEVE RIGNEY AND
M. KEITH THOMPSON**

WordPerfect Office, Version 3.1, is tightly integrated with WordPerfect Corp.'s line of products—particularly its popular word processor. Office's e-mail, scheduling, and telephone database have the same interfaces, keystrokes, and "look and feel" of its word processing kin in both the DOS and Windows versions. WordPerfect users will feel right at home here.

Administrators in offices that use WordPerfect will appreciate the shallow learning curve it offers their users. Although it helps to have WordPerfect installed, Office works fine without it.

But if you have not standardized

around WordPerfect, or your users don't know or like the way the WordPerfect for DOS or WordPerfect for Windows operate, you may want to consider another e-mail product.

END USER

To someone who doesn't know WordPerfect's special function key sequences, Office's menus aren't exactly intuitive. But if you are familiar with the standard WordPerfect keystrokes, the DOS interface is easy to use. Actually, once you've learned the importance of F7 (exit) and other WordPerfect sequences, you should have little difficulty creating and mailing messages.

Both the Windows and DOS versions of Office include other features in addition to standard e-mail. In fact, Office is an excellent group and personal productivity tool. You can use Office to keep track of your personal and group schedules, plan appointments and recurring events with the built-in calendar, and make personal notes to yourself using the Notebook.

You can use Office's e-mail functionality in combination with its PIM (Personal Information Manager) features. But, like Futurus Team, you can use Office's Notebook and Calendar to enhance workgroup efficiency. For example, you can use the Scheduler to electronically plan group meetings. The Scheduler will subsequently alert you of the status of the proposed meeting, who can make it, who cannot, and which departments those persons work in.

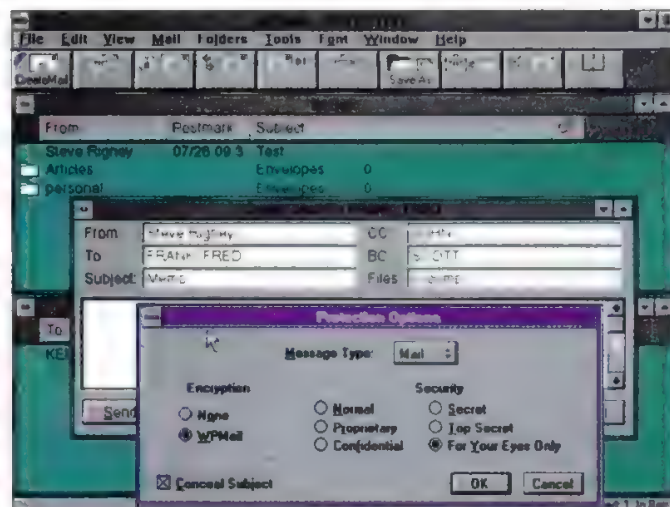
When you choose to edit a particular message, Office automatically launches

the word processor. If you do not have a copy of WordPerfect for DOS or Windows, you can launch another word processor to edit or create electronic messages. The edited messages are saved in their original file formats and sent as attachments to your message.

Office's text editor is in no way a subset of WordPerfect, but it relies on the WordPerfect word processor for spell-checking. Office's spell-checker will not work correctly unless you have the WordPerfect word processor installed and running. Office lets users apply several levels of security to their messages, including Normal, Proprietary, Confidential, Secret, Top Secret, and For Your Eyes Only. These levels, plus the program's ability to encrypt messages and attachments, ensure that no one can gain access to your important messages unless you want them to.

The Outbox features functions like Retract and Resend to greatly increase your productivity and to save yourself

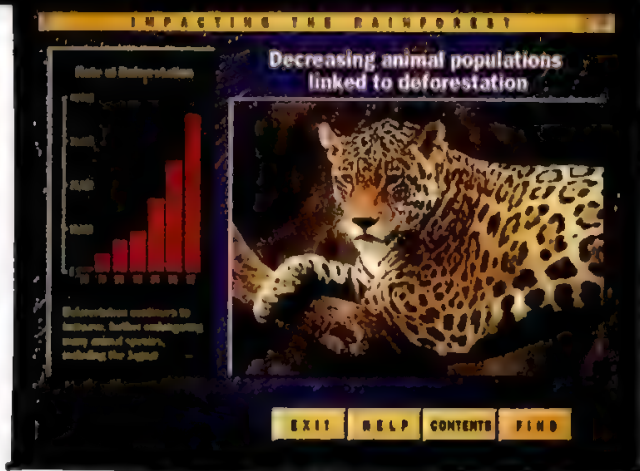
SUITABILITY TO TASK				
WordPerfect Office (Windows edition)				
	POOR	FAIR	GOOD	EXCELLENT
Basic messaging	☒	☒	☒	☐
File management	☒	☒	☐	☐
Interprocess communications	☒	☒	☒	☐
Mail server installation	☒	☒	☒	☐
Client installation	☒	☒	☒	☒
Maintenance	☒	☒	☐	☐



WordPerfect Office offers multiple levels of security for electronic messages, as well as the ability to drag and drop in Windows.

from embarrassing moments. If you send a message to your boss and remember that you didn't check the spelling, you can retract the message anytime until it is read. The process is simple; you simply choose that particular message from the

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cc:Mail allows you to send messages transparently and maintains a consistent set of features across all these major platforms. That's because it was built from the ground up to support network environments made up of different platforms and LANS—a design consideration that seems to elude most e-mail systems. Further, it's the only system

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cc:Mail offers an impressive set of administration tools. Such as Automatic Directory Exchange, a product which automatically collects any changes

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made to the directory and updates the entire network. It's also the first package of its kind that's built on a new, fully scalable messaging architecture. Which means it can accommodate 5 to 500,000 users. And grow along with your business. One more thing: cc:Mail has won every major industry award, including the Windows Magazine 1992 WinAward and ComputerWorld's 1992 LAN Brand Preference award.



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list in your Outbox and select Retract or Delete. The Retract feature also works across gateways and different platforms supported by Office. Resend is another useful feature found in Office's Outbox. You can select a message in your Outbox, edit it, change addresses, and resend it without retyping the entire message.

Office's documentation is well written and includes a helpful Workbook full of examples and worksheets. The package also ships with a Remote Mail program, something most other vendors offer as an option.

Unfortunately, Office's message-sorting capabilities are limited. While you can search your in-box for a variety of fields (including date, time, and text string), you do not have much control over which messages you sort through.

ADMINISTRATOR

Office is not difficult to install, but you must follow the documentation step by step to complete the installation properly. There are no helpful menus or message prompts to take you through the process.

Migrating users from the NetWare bindery or a VINES user database is easily accomplished by choosing NetWare or Banyan from the GENUNB program. Within minutes your users have been

RESOURCE.NB—in which you record the information the hosts need to function, including user names and related information. Then you run the GENOFF program to build the actual system files and directories the e-mail system uses. GENOFF makes three files with the same name and a .FIL extension. This conversion process works well when you follow the well-written manual, but if you get steps out of order you can be in for a long afternoon.

Office includes over 20 command line start-up options, many of which determine where Office looks for and creates files. Conveniently, these options can be set as DOS memory variables in the user's log-on script. To assist the system administrator, the documentation provides detailed instructions on how to set network directory rights for each user.

To make more efficient use of disk space, Office does not make multiple copies of a message or file sent to multiple users. Rather, Office creates a pointer to the file in the mail-directory structure. In a multiple host or domain installation, Office sends new address information to the other host on the system, keeping all users updated with the correct addresses.

Office is weak on administrative reporting. There are no reports to show disk-space utilization for users or groups. Additionally, system administrators do not have a simple mechanism to track mail usage.

The package does not limit the number of users you can include on a host. By not doing so, Office can handle mail for more users than the total number of users the network operating system will allow to be logged on simultaneously. Users that frequently log on for short periods of time from a shared PC can still have full e-mail privileges. In general, each file server with users needing e-mail should have its own host. Additionally, you can install multiple hosts on one file server and have each host service a different group of users. All mail users can send message faxes to any Group III fax machine with the in-

FACT FILE

WordPerfect Office, Version 3.1

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057; 800-451-5151, 801-225-5000; fax, 801-228-5077



List price: For 5 users, \$495; for additional 20 users, \$1,295

Requires: Server: 640K RAM, 3MB hard disk space. Workstation: 640K RAM, 3.4MB hard disk space. DOS 3.1 or later, Microsoft Windows 3.x for Windows workstation

In short: An excellent choice for WordPerfect users wanting to add more than just e-mail to their workgroups. While not the most intuitive program we reviewed, WordPerfect Office provides basic e-mail functionality and offers robust external mail connectivity.

 ON READER SERVICE CARD

EXECUTIVE SUMMARY

FROM THE DESKTOP WordPerfect Office relies too heavily on familiarity with the WordPerfect word processor. On the other hand, WordPerfect users should find it a natural extension.

FROM BEHIND THE GLASS DOOR Mail management tools are almost nonexistent. For example, Office has no way of checking the amount of disk space each user takes up.

added to the Office mail system.

Office's Connection Server, previously an extra-cost option, is now included and operates on a networked PC as a message router to transport messages between separate hosts. The Connection Server station and the hosts it services comprise a domain. The Connection Server must have a drive letter assigned to each host, limiting the number of hosts per Connection Server to available drive letters.

Each host has three information files—HOSTID.NB, USERID.NB, and

cluded Fax Service. The Fax Service runs along with the Connection Server and works on any CAS-compliant fax device.

Setting up an asynchronous bridge to handle remote e-mail users is simple and quick. The Bridge program will even run as a TSR on the Connection Server, allowing you to have one computer serve two purposes. Depending on your traffic load you will choose the standalone or the TSR mode, but the programs provide the same functionality. You must have a Connection Server running to provide remote e-mail services. Office uses the Connection Server to route messages to and from all Remote Mail users.

WordPerfect offers gateways to the most popular mail systems. With gateways to AT&T EasyLink, MCI Mail, MHS, and PROFS from IBM, Office users can send and receive mail from just about anywhere. Additionally, Office supports X.400 addressing through a third-party product, Retix OpenServer 400. And WordPerfect provides these same features for Data General, Macintosh, UNIX, and VAX users. Each of these systems can communicate with each other with a Connection Server either through a modem or network connection.

Although WordPerfect Office lacks some reporting that other products offer, it implements the basic e-mail functions well and integrates easily with external systems through multiple gateways. □

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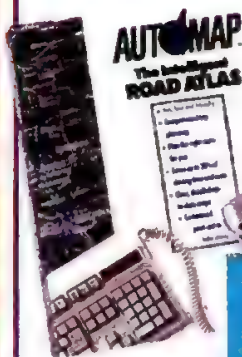
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Windows Draw

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Winner of the 1992 WIN Award presented by Windows Magazine, Carbon Copy for Windows is the

"closest thing to having a remote control built into Windows itself." From your PC, access your office PC from home, check e-mail messages while traveling or collaborate on a document with a co-worker in another building. An easy-to-use file transfer utility, complete with data compression and error correction, enables you to transfer files fast and error-free. Microcom #07731

Carbon Copy DOS #09466 \$132
Micro Courier for Windows #07732 \$62

\$84

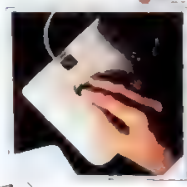
BitFax/BitCom

BitFax is everything a fax program should be. With WYSIWYG faxing, your screen view is just what you will fax. Other features let you import an existing phone list for use with BitFax, fax pages from several Windows applications in the same fax, and receive faxes in the background while you work. In addition, BitCom offers a powerful script language, popular file transfer protocols and extensive terminal emulation. Bit Software #10827

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\$74

Felix The Better Mouse

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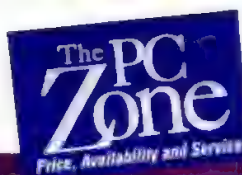
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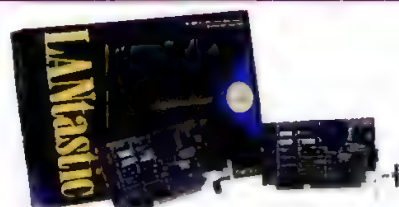
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Netware 3.11

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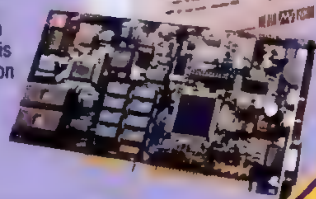
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BUSINESS ILLUSTRATION SOFTWARE

Art for the Masses

Everyone wants to add graphic pizzazz to dull business documents, but not everyone needs professional illustration software. These five low-cost packages offer just the right set of tools for workaday illustration tasks.



It took Michelangelo four years to complete the ceiling of the Sistine Chapel. With the latest generation of business illustration software, you can create a masterpiece in a matter of minutes. If you need to design a logo, annotate a pie chart, or create a sales flier, these packages can handle the task more quickly, easily, and inexpensively than their professional-level brethren.

Where professional illustration software caters to illustrators and designers, business illustration software caters to nonartists. With the best of these packages, if you can install the software, you can create a work of art your first time out. All of the packages in this review will run on a basic 386 setup. All you need is a surprisingly small outlay of cash (all of these packages carry a retail price of less than \$200, with street prices of less than \$100), plus couple of hours to master the

IN THIS REVIEW

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by Gayle C. Ebreman

software and a little bit of creativity.

At their most basic, these packages offer routine vector drawing tools, some simple image manipulations such as rotate and flip, a few interesting text effects, limited color handling, a library of clip art, and the ability to access Microsoft Windows fonts. The best of the bunch add more sophisticated drawing tools (such as a true Bezier tool); some CorelDRAW-like text effects; professional-level color handling (such as the ability to use multicolor gradients); a huge library of high-quality, easy-to-manipulate clip art; and a variety of TrueType and Type 1 fonts.

Professional-level packages will give you all this and more: more clip art, more image manipulations (like enveloping and warping), more fonts and font effects (like extruding), more color controls (such as color separations), and more file-format options. But they'll also give you

a more complicated interface and a steeper learning curve.

We define business illustration packages as dedicated illustration products that retail for under \$500, include a library of editable clip-art images, and can import and export files in at least one standard format.

Two of the products in this review, Windows Draw 3.0 plus OLE and Arts & Letters Apprentice, are feature subsets of their pricier siblings, Micrografx Designer and Arts & Letters Graphics Editor, respectively. A third, KeyDraw! Plus, which uses a GEM interface, is a professional-level package (Digital Research's orphaned Artline) priced to appeal to business users. The two remaining packages, ComputerEasy Draw (previously known as Ventana Draw, and later Drô) and KeyDraw! Plus for Windows, stand on their own: They have no software connections to fall back on, although KeyDraw Plus! bears a striking resemblance

to a presentation graphics package from Tilcon Software called GraphicWay. A sixth package, Addison Research's WinDraw (\$79), was dropped from this review because it includes only symbols, not true clip-art images, and cannot import files of any sort. But it may be ideal if you want to create your own clip art.

GIVING BUSINESS USERS AN EDGE

Extensive clip-art collections, easy-to-master interfaces, a full array of drawing

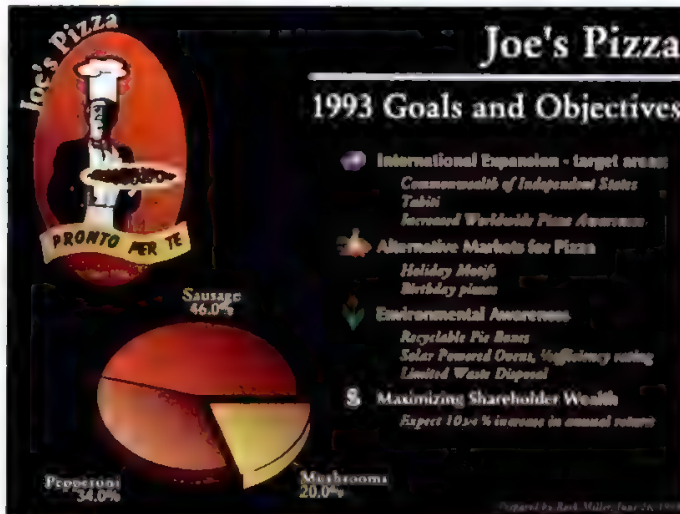
tool to make the task simpler. If you're more interested in fancy text effects, see the sidebar "Drawing with Words."

Business illustration packages are not particularly adept at tasks that require precision. Most allow you only rudimentary fine-tuning of the rulers, grids, and snap-to options, and most don't let you assign exact numeric measurements to drawing elements. If you need this type of precision, you'd do well to turn to a parametric illustration package (see the sidebar "Drawing by Numbers"). Business illustration packages, with the exception of the hybrid KeyDraw! Plus, cannot import or export the .DXF files used by most CAD programs. They also lack the associative dimensioning and the precise rotation capabilities necessary for technical illustrations. Nor do they offer autotracing. If you need this type of power, turn to a professional illustration package.

RECOGNIZING THE PLAYERS WITHOUT A SCORECARD

Although these products are all designed to make creating business illustrations a quick and painless task, their approaches vary greatly. KeyDraw! Plus, the only DOS-based application, is a business illustration package in name only; *PC Magazine* reviewed this product when it was in its incarnation as Artline, a professional illustration package ("Artistry for All: Four Illustration Packages," October 29, 1991). It possesses features such as layering and autotracing that the other packages lack. But with these abilities comes a greater level of complexity: You may be able to do more with this package, but it will take you longer.

By contrast, the other packages in this review stress ease of use. Where ComputerEasy Draw and Windows Draw provide tools for drawing primitives such as rectangles and circles, Arts & Letters Apprentice provides resizable symbols that you select by number from a dialog box. Being able to select and place a beveled-edge box is certainly less time-consuming than creating one, but it takes some getting used to. Where the other packages force you to create data charts elsewhere,



Creating this annotated pie chart tested the packages' drawing tools and text and color handling, as well their ability to import and manipulate both graphics and blocks of text.

tools, and ample text-handling options give these packages an edge for creating business illustrations. If all you need to do is break apart and recolor some clip art, these packages make it easy. If you want to do something a bit more complicated, such as create a logo, display ad, or flowchart, these packages have the drawing tools and color-handling and text-handling abilities you need to create professional-looking images. Since most can import and export standard file formats such as CGM and .WMF, they are also ideal for annotating and illustrating charts created with a presentation graphics package. And though most are not specifically designed for this purpose, with a little work you can use these packages to create simple bar and pie charts; most of the packages even include a pie

Our Contributors: LORI GRUNIN is an associate editor of *PC Magazine*. GAYLE C. EHRENMAN, ANGELA GUNN, and CAROL LEVIN are staff editors of *PC Magazine*, and ROCK MILLER is a frequent contributor to *PC Magazine*.

however, Apprentice provides a mini-spreadsheet and integrated charting functions. KeyDraw! Plus for Windows one-ups Apprentice by providing a dedicated charting module and a wide variety of chart types. This package also offers some sophisticated image manipulations that none of its competitors offer.

Windows Draw has the widest array of file import and export options of any of the Windows packages. It can read and write all the standard file formats, including AI, EPS, PCT, and .PCX, as well as its native format, .DRW, which is also supported by Designer. Its interface is the cleanest of all the packages in this review, and its tools perform just as you would expect.

ComputerEasy Draw suffers from poorly organized menus, but it has all the tools you are likely to need.

HOW WE TESTED

To put these packages through their paces, our reviewers performed six tasks, three of which centered on the production of an annotated pie chart (printed on a Tektronix Phaser II printer). These tests reflect the abilities users need in a business illustration package and stress each package's type handling, color handling, drawing tools, and import filters.

The accompanying illustration consists of three parts: a logo, a pie chart, and a block of text. We asked reviewers to create the logo using the package's clip art, drawing tools, gradient fills and text-on-a-path capabilities. Next, reviewers imported the pie chart, which was created in Harvard Graphics and exported as a .WMF file; they recolored it and annotated it with labels and pointers. The third task involved importing a block of ASCII text and adjusting its size, fonts, and color.

Additional tasks involved creating a flowchart using the package's primitives, line tools, and hatch patterns, and importing a variety of standard-format clip-art images, editing them, and then exporting them. We printed the final output on an HP DeskJet 500C, an HP LaserJet III, and the Tektronix Phaser II.

WHICH PACKAGE SHOULD YOU BUY?

Your needs, personal taste, and artistic ability will play as large a role in your buying decision as a package's feature set

Suitability to Task:

Business Illustration Software
Windows Draw 3.0 plus OLE proved the most capable of these packages when it came to completing the business illustration tasks we set out for them, although Arts & Letters Apprentice's text handling proved superior.

Since these packages are primarily intended for drawing, they must have an ample selection of easy-to-use **basic illustration** tools. How well the object-editing and object-manipulation tools work will determine how easy it is to perfect your illustration. You should also be able to output your illustrations quickly and accurately to a number of relatively inexpensive output devices.

Most business illustrations include text, so a package's proficiency at **type handling** is crucial. The ability to import and manipulate blocks of text as well as to fit text to a path and apply special effects such as stretching or skewing is a must. Leading and kerning controls are also important if you want to fine-tune your text.

will. If you need to get up and running quickly, opt for a package that offers a full tutorial and an easy-to-understand interface. If you lack drawing skills, your best bet is a package that gives you an ample supply of high-quality clip art and some way to preview the images.

If you want to use drawings from other sources or use your completed drawings in a variety of other applications, you need a package that offers a full array of reliable import and export formats. If you need to create data-driven charts, choose a package that gives you integrated charting functions. And if you need to work with blocks of text, choose a package that includes full word-wrap capabilities and the ability to import paragraphs.

Business illustration software proves that less complicated needn't mean less capable. These packages provide everything you need to create an illustration masterpiece. The rest is up to you.

SUITABILITY TO TASK

Product Name	POOR FAIR GOOD EXCELLENT			
Basic illustration	●	○	○	○
Type handling	●	●	○	○
Color handling	●	●	●	○
Business presentations	●	●	●	●

If a package has good controls for **color handling**, it lets you easily create and specify gradient fills, patterns, and solid fills. It should also let you create a new palette or customize an existing one without much difficulty.

To make it easy to create **business presentations**, a package must allow you to work with graphics that have been imported from a number of other sources. The ability to import a variety of standard file formats is crucial; so is a good selection of attractive, well-organized clip art that you can easily manipulate. And when you have finished creating your illustration, the package must be able to export it and output it to a variety of black-and-white and color printers.

Computer Support Corp.

Arts & Letters Apprentice

BY CAROL LEVIN

If you think blending applies only to daiquiris, and you can't draw so much as a square, then you meet the prerequisites for using Computer Support Corp.'s Arts & Letters Apprentice. This \$169 package features a core set of drawing and editing



Arts & Letters Apprentice lets you mix colors using one of three color models: CMYK, RGB, or HSB. You can name and save the custom-mixed colors and add them to palettes.



EDITORS' CHOICE

•Windows Draw 3.0 plus OLE

tools; a collection of 3,500 high-quality clip-art images borrowed from its professional-level sibling, Arts & Letters Graphics Editor; and plenty of custom options that give you the latitude to create attractive business illustrations easily.

The program's approach to drawing primitives is unconventional but efficient. Instead of dedicated tools, Apprentice gives you a suite of 65 symbols from which you select a primitive. You can convert both symbols and clip-art images to editable free-form objects, then ma-

SUITABILITY TO TASK

Arts & Letters Apprentice

	POOR	FAIR	GOOD	EXCELLENT
Basic illustration	●	●	●	○
Type handling	●	●	●	●
Color handling	●	●	●	○
Business presentations	●	●	○	○

nipulate them using a range of object-manipulation tools, including rotate, skew, and duplicate. All of these features, as well as the tools for line and Bezier drawing, for fitting text to a curve, and for reshaping a curve using control points, can be accessed via the toolbox.

Apprentice goes beyond these basics by offering an integrated charting function with a mini-spreadsheet and a selection of graphs. In addition, there is an Activity Manager through which you access curves for text effects and sample illustrations, and a series of excellent mini-tutorials, as well as canned gradient backgrounds and text effects (such as warping and shadowing) handed down from Graphics Editor.

Though the procedures for achieving special effects makes it difficult to ruin an illustration, they are unnecessarily awkward. For example, to create text with a foreshortened effect, you call up a prototype from the Activity Manager, ungroup the elements, delete the instructions, and replace the sample with your own text. With a little patience, you can combine two effects to achieve a third; we used foreshorten in combination with duplicate to simulate an array.

Special effects aside, this package offers some of the best text handling around. Apprentice lets you import blocks of text, bring them in through the

Picking a winner from among these business illustration packages was an unusually easy task. Only one of the products we reviewed, Micrografx's Windows Draw 3.0 plus OLE (\$149.95), offers both the functionality and user-friendliness that business users

and other nonartists require.

Windows Draw's interface is so slick and unpretentious that it is easy to overlook the power under the hood. The program has virtually everything you need in a business illustration package, with a few nifty gadgets—like both a conventional freehand curve tool and a sketch tool that converts your scribbles into editable Bezier curves—thrown in for good measure. Its file import and export capabilities are as good as those found in any professional package, and its drawing tools can ably handle any business-level task. Add in the wide array of attractive clip-art images and TrueType fonts it ships with and you have the makings of a really good deal.

Text handling is Windows Draw's one weakness. Its fit-text-to-path capabilities are first-rate; they even let you bind text to a curve without incorporating the curve object into the editable text object. But its paragraph controls are below par. You cannot adjust text leading, word spacing, or tab settings. It is also difficult to manipulate imported blocks of text.

Where Windows Draw's text facility pales, Computer Support Corp.'s \$169 Arts & Letters Apprentice shines. You can adjust the leading, kerning, letter spacing, and word spacing, or create named type styles and some interesting text effects. Unlike the other packages in this review, though, Arts & Letters Apprentice does not offer dedicated drawing tools for creating primitives. Instead, it gives you a library of symbols that you can manipulate. Adjusting to this

method takes a little time, but it can be as effective as the more traditional approach. Far more limiting, however, is the package's paucity of file imports and exports. It can handle only .PIC, TIFF, and .WMF files, and it won't let you manipulate .WMF files after importing them.

SoftKey Software Products' \$79.95 KeyDraw! Plus was never intended as a business illustration package. It started life as Artline, a professional illustration package orphaned by Digital Research. It packs some powerful tools and has an appealing price but is far too complex to be truly useful for quickly creating simple illustrations.

Its sibling, KeyDraw! Plus for Windows (\$79.95), also bears a strong resemblance to another product: Tilcon Software's GraphicWay, a presentation graphics product. This is a case of mismarketing; KeyDraw! Plus for Windows lacks the drawing tools and file filters needed to make it useful for business illustration, though it is fairly proficient at charting.

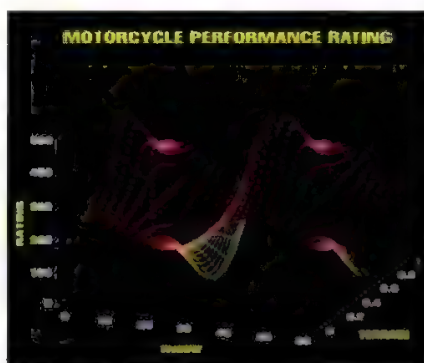
ComputerEasy International's ComputerEasy Draw, on the other hand, has all the features you need, but they fall short in their implementation. This \$149 package will force you into battle to create even the most basic illustrations. Its file filters are downright unpredictable, and its printing is well below par. It does include a simple screen-show utility and an easy-to-use animation module, which lets you turn ComputerEasy Draw illustrations into simple flip-book-style animations.



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FACT FILE

Arts & Letters Apprentice, Version 1.1

Computer Support Corp., 15926 Midway
Rd., Dallas, TX 75244; 214-661-8960;
fax, 214-661-5429

List price: \$169.

Requires: 2MB RAM, 9MB hard disk space, Microsoft
Windows 3.x.

In short: Arts & Letters Apprentice is a full-fledged,
low-cost business illustration package with all the
basic drawing and editing tools as well as an excellent
clip-art library and special text effects. To overcome
its limited file support, you'll need to upgrade to the
high-end Arts & Letters Graphics Editor.

ON READER SERVICE CARD

Windows Clipboard, or enter text manually. You can then adjust the leading, kerning, word spacing, and letterspacing of your block. You can even create named text styles.

The clip art and color handling match the text controls in sophistication. The high-quality clip art ranges from simple page borders to complex business illustrations, which you can easily break apart and recolor. And Apprentice makes it easy for you to find just the right shade or pattern for your image by offering custom color mixing and color naming as well as predefined palettes. You can also create named patterns from the supplied building materials, such as slate and Spanish tile.

LIMITED FILE SUPPORT

There are a few weak points that even the artistically inept will quickly stumble on. The most inhibiting is Apprentice's limited import abilities. It directly imports only .PIC, TIFF, and .WMF files, but it doesn't let you manipulate .WMF files once you've imported them. During testing, this restriction left the final illustration—whose centerpiece was a pie chart imported in .WMF format—looking unfinished; we simply couldn't recolor the chart. And we had to skip the file import test altogether, since it required importing and manipulating CGM, EPS, and .WMF files. Yes, you can cut and paste images through the Clipboard. But these images are static: You can resize them, but you can't edit them.

The text and line tools need adjustments so that changing the width of the line tool does not have a global effect. Currently, if you set the line tool to a width of 5 points, all subsequent text will be 5 points wide—an effect that is wholly independent of font size. And applying arrows as a line-end style is a needlessly complex exercise; you must painstakingly tack a clip-art arrow onto each line. A variety of arrow-end styles should be readily available options in the line attribute dialog box.

On our tests, printing was not consistently smooth. Color PostScript printing was sharp, and the DeskJet handled black-and-white line art without a hitch. But the vector hatch patterns on our test flowchart printed solid black on the LaserJet III.

Arts & Letters Apprentice may not outfeature or outprice the competition, but it will bring the power of illustration to your business documents. If you need to import a wide array of file formats, you would do well to consider another business illustration package, or even an upgrade to Arts & Letters Graphics Editor for \$250.

ComputerEasy International Inc.

ComputerEasy Draw

BY GAYLE C. EHRENMAN

On paper, ComputerEasy Draw looks like a winner; in practice, though, it is merely an also-ran. This \$149 business illustration package has all the features you could ask for, including some (such as object locking and masking) that none of its competitors offer. But even the simplest drawing tools can be tougher to use than they should be. You can create attractive illustrations with ComputerEasy Draw, but not without a struggle.

The awkwardness starts with installation: The package includes 24 TrueType and Adobe Type 1 fonts, and 400 clip-art images, but it offers no selection options; you're forced to install all of these things. You must then install the fonts from

SUITABILITY TO TASK				
ComputerEasy Draw				
	POOR	FAIR	GOOD	EXCELLENT
Basic illustration	☒	☒	☐	☐
Type handling	☒	☒	☐	☐
Color handling	☒	☒	☒	☐
Business presentations	☒	☐	☐	☐

the Windows Control Panel to make them accessible to the package. And you'll have to remember what they look like once you start ComputerEasy Draw, because there is no way to view samples within the package.

The icon- and menu-driven interface features a floating, customizable toolbox that is automatically saved with your drawing. And though ComputerEasy Draw lets you display its 256-color palette while you work, the palette swatches are dithered. Fortunately, though, the package does not dither the illustrations themselves.

The tools are all here, but at times their implementation mars their usefulness. Some of the drawing tools, such as squares, circles, and polygons, work as you would expect. Others require far too many steps to use. To draw an arc, for example, you must first draw a circle and then trace over the section you want to use as an arc. The Bezier curve tool is also a mixed bag: To draw a curve with this tool, you specify the line, then pull the nodes into the shape of your curve. You can, however, view and manipulate the tangents of the curve. Zooming is equally awkward, since you can't enter



ComputerEasy Draw includes a simple-slide show utility that lets you create on-screen presentations from your illustrations. The utility displays thumbnails of the illustrations as you add them to a show.

IT PRINTS UP TO 20 PAGES PER MINUTE.

**IT ADJUSTS FROM ONE LANGUAGE TO
ANOTHER-AUTOMATICALLY.**

IT PRINTS IN EVERY CONCEIVABLE SIZE.

IT HOLDS UP TO 1,500 SHEETS OF PAPER.

**IT REDEFINES WHAT A NETWORK
PRINTER CAN DO.**

IF IT DID ANY MORE,

The new COMPAQ PAGEMARQ 20 and COMPAQ PAGEMARQ 15. Two network laser printers that will immediately establish the industry benchmark. Printers for those who want nothing short of everything.

After rather extensive R&D, we realized the average network printer was doing more to raise your network's blood pressure than its productivity level.

Which led us to more extensive R&D and two breakthroughs: two network laser printers which are bristling with features designed to help everyone work in harmony.

For starters, COMPAQ-built, RISC-based controllers, along with powerful print engines, run our printers at 15 and 20 PPM.



And at 20 PPM, that's an average of 100% faster than HP IIIsi in PostScript applications. Which helps keep your network's output more than up to speed.

Then there's the ability to print in sizes up to 11" by 17". Which can really make your day if it's filled with everything ranging from envelopes to double-page layouts to CAD plots to spreadsheets.

The built-in motorized paper trays can hold up to 1,500 sheets, more than any other desktop printers. Allowing you to put your time to far better uses than loading paper.

To Compaq engineers it simply wasn't enough for our printers to understand both PostScript Level 2 and PCL 5. Therefore, unlike other printers, ours have an Intelligent Emulation

YOU'D BE OUT OF A JOB.



Sensing feature that continually monitors, with radar-like precision, the language which anyone is using at any moment. It will then automatically adjust to that emulation, without your lifting a finger.

A truly network-ready printer should meet all of your network needs. This is why our new COMPAQ PAGEMARQ Laser Printers

both Novell and AppleTalk environments, without the need for a print server.

The printers also offer you five interfaces, so that you can simultaneously run Ethernet or Token Ring, AppleTalk, both a serial and a parallel port, and even an Internal FAX Modem. Which will lead to better communication across the entire network. Rather than the kind of language that

best remains unprinted.

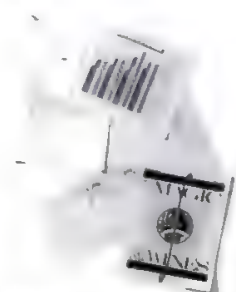
Completing the picture is the 800 x 400 COMPAQ High-Resolution Print Mode, created to give you exceptionally crisp text and graphics.

Both the Programmable Font Modules and internal 60-MB Hard Drive let you store PostScript fonts permanently, without having to constantly download.

Thus, what you've got amounts to far more than merely a network printer.

You have the brainchild of a company which holds the belief that utter chaos does not have to be standard operating procedure in your network.

For more on COMPAQ PAGEMARQ printers, just turn to the next page.



They print in sizes up to 11" by 17." They can handle CAD images, spreadsheets, and even double-page layouts. Multiple Twin-Trays hold up to 1,500 sheets. Impressed?



Our Intelligent Emulation Sensing feature continually monitors, then automatically adjusts to either PostScript Level 2 or PCL 5 depending upon which language you're using. You needn't lift a finger.



THOSE WERE THE BROADSTROKES. NOW HERE'S THE FINE PRINT.



COMPAQ PAGEMARQ 20: 20 PPM & 20-MHz AMD 29000 RISC w/128-K cache & 4MB RAM standard, expandable to 20MB & 1,500-sheet (standard)

COMPAQ PAGEMARQ 15: 15 PPM & 16-MHz AMD 29000 RISC & 4MB RAM standard, expandable to 18MB & 750-sheet (standard), 1,000-sheet max w/ optional second TwinTray

BOTH MODELS: Up to 800 x 400dpi (COMPAQ High-Resolution Mode) & PostScript Level 2 and PCL 5 w/ Intelligent Emulation Sensing & One slot/port each for AppleTalk, Network Interface Cards, Internal FAX Modem, Serial and Parallel Port & Available Options: Internal 60-MB Hard Drive, 1- and 2-MB Programmable Font Modules & Consumables: One-piece cartridge w/12,000-page yield

At Compaq, we realize even the most advanced network printers in the world aren't worth the toner in their cartridge kits if you can't get the service or the parts that you need whenever you need them.

Thus we've designed CompaqCare. This is our comprehensive service and support program which includes our one-year free on-site* limited warranty.

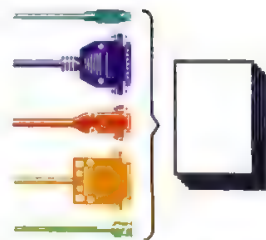
It will also provide you with, among other things,

repair of your printer by the second business day, anywhere in the U.S.

Whenever you need consumables, you can buy them at all participating office supply stores, at 3,000-plus Authorized COMPAQ Reseller locations, or right from us.

For any questions, or to learn more about our new program for recycling consumables, phone our hotline at 1-800-345-1518 in the U.S.; in Canada, call 1-800-263-5868.

You'll find dedicated printer specialists eager to convince you that the path to greater network productivity begins not only within yourself, but along the paper path that is inside your COMPAQ PAGEMARQ Laser Printer.



Five interfaces, with a direct connect to Novell and AppleTalk, lets you simultaneously run Token Ring or Ethernet, AppleTalk, a serial and parallel port, plus an Internal FAX Modem.



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CIRCLE 137 ON READER SERVICE CARD

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FACT FILE

**ComputerEasy Draw,
Version 2.015**

ComputerEasy International Inc., 414 E.
Southern Ave., Tempe, AZ 85282;
800-522-3279, 602-829-9614;
fax, 602-829-9616

List price: \$149.

Requires: 2MB RAM, 3MB hard disk space, DOS 3.0
or later, Microsoft Windows 3.x

In short: On paper, ComputerEasy Draw looks like a
champion; in performance, it is more like an also-ran.
All the features you could ask for are here, but an
awkward implementation renders them virtually un-
usable in many cases.

ON READER SERVICE CARD

a percentage to zoom by; instead, you must zoom by preset intervals, none of which ever seem right.

THE POWER AND THE FURY

ComputerEasy Draw offers fairly powerful text handling but makes it tougher to use than it should be. You create text in a full-screen editor, but you must change fonts from a separate menu. The package has full word-wrap capabilities, and it can import entire paragraphs from a file or the Clipboard. Unfortunately, there is no tab or margin ruler and no way to adjust leading, so formatting blocks of text can be difficult. You can fit text to a curve, but you can't specify its starting point. Likewise, you can't specify whether text should be fitted to the outside or inside of a curve. To create our test logo, we had to draw an oval, fit the text to the curve, group the two objects, then rotate them until the text was in the desired location.

The clip art is equally difficult to work with. There is no on-screen preview, nor even a paper catalog to help you select the right image, and the filenames don't offer much help. They range from Tree (a single image of a tree) to Misc1 (a collection of assorted small images). To use one of these proprietary-format scanned images, you must merge it into an existing drawing. You must then ungroup the clip-art file, select the images you don't want, and delete them. For the most part, these images are hardly worth the trouble. They are not totally unusable, but

they are so awkwardly constructed that you'll have to be extra creative to make them work for you. We used a thumbnail-size image of a woman to create our test logo. Once we enlarged it, we were able to recolor parts, but no matter what we tried we couldn't turn the apron in the image into an opaque object.

While importing blocks of text poses no real problem for ComputerEasy Draw, importing and exporting graphics is another story entirely. The package supports only a limited number

of file formats, and even these don't work all that well. Our annotated pie chart test called for the import of a chart in .WMF format. ComputerEasy Draw imported the chart at roughly three times its actual size, though it maintained all the details. Reimporting a file created in the package and then exported in CGM format proved equally problematic. The logo file we first created in ComputerEasy Draw, then exported as CGM, imported upside down—minus its text.

To its advantage, the package includes an easy-to-use animation utility that can turn your illustrations into a flip-book-style animation, and an on-screen slide show that works quite well.

With these exceptions, the many features just don't work quite as well as they should. Perhaps the next version of ComputerEasy Draw will manage to channel this power into a more usable form.

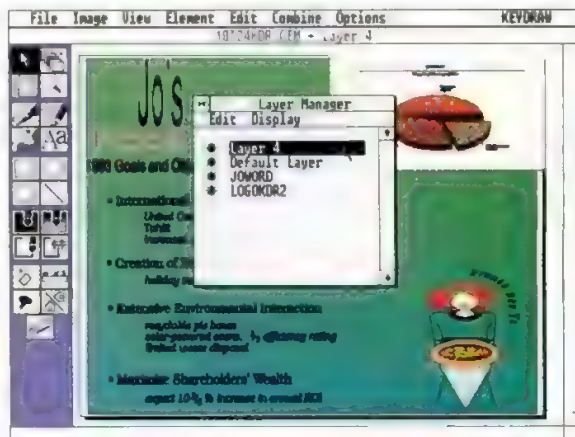
SoftKey Software Products Inc.

KeyDraw! Plus

BY ANGELA GUNN

KeyDraw! Plus is something of an anomaly: The program has professional-level illustration tools, but it is priced to compete with business illustration software. It is a DOS-based illustration package—not the busiest environment for graphics applications these days—but its attractive \$79.95 list price may make even Microsoft Windows users stop and take a good look.

KeyDraw! Plus began life as Digital



KeyDraw! Plus lets you place elements of an image on separate layers so you can manipulate them individually. The Layer Manager makes it easy to switch from one layer to another.

Research's Artline, a professional-level illustration package. While it could not quite keep up with the top-tier professional packages, such as Micrografx Designer or CorelDRAW, it can't quite be labeled as a business illustration package, either. Its toolset and scope are more complex than those of the other packages in this review, and its interface is a bit more ornery.

KeyDraw! Plus is based on the GEM interface, a DOS graphical environment, which is good-looking if somewhat difficult to manipulate at first. Users will appreciate its ability to run in 640K RAM (though expanded memory is a must for large images).

The package features a customizable 21-icon toolbox that includes a full set of commonly used drawing tools (including a Bezier tool), as well as text and fill tools. More advanced features, such as numerically adjustable scaling and rotation and interruptible autotracing, are accessible through drop-down menus. You can create icons in the toolbox for many of the menu commands, such as Rotate Grow—a sample custom tool supplied with the program—which duplicates, rotates, and

SUITABILITY TO TASK

KeyDraw! Plus

	POOR	FAIR	GOOD	EXCELLENT
Basic illustration	●	●	●	○
Type handling	●	●	○	○
Color handling	●	●	●	○
Business presentations	●	●	●	○

scales a selected object. The tool editor is difficult to use, though, so this may not appeal to the average user.

Once you understand the logic of the GEM interface, it is possible to create complex pictures quickly and fairly easily. The tools work as you would expect, and advanced options such as blends and tweening are well executed. (Tweening, or interpolation, lets you create complex blends that transform objects in shape and color.) In fact, KeyDraw! Plus was one of the few packages in this review that could blend a grouped object.

Files can become complex in this package, but the Layer Manager lets you readily control and display only specific elements of an illustration. The package can support an infinite number of layers; we were able to retain the detail work of our test logo in separate layers, making it easy to manipulate components of the illustration without tangling with the whole image. Cutting and pasting between layers is also simple and reliable.

COLOR DILEMMA

KeyDraw! Plus comes with one palette (containing colors and a selection of fountain fills), which you can customize using either CMY, RGB, or HSL color models. Unfortunately, you'll have trouble seeing exactly what your colors are. Though the package supports 16.8 million colors, it can display only 16 without dithering.

The package also offers a mixed bag in terms of text. It can't import a prepared text file (text in our pie chart was unworkable), but once you type some text

anchor The starting or ending point of a Bezier curve or spline. As a verb, *anchor* means to place one point of an object so that it does not move; this allows you to manipulate the rest of the image without altering the endpoint.

attributes The characteristics of an object, including shape, size, and color.

Bezier curve A mathematically calculated curve that connects a small number of points smoothly. You can perform first- and second-order manipulations of such curves (changing the position of a node as well as the slope of the curve at that node).

bitmap A representation of an image composed of a pattern of individual pixels (dots) rather than lines and shapes. Bitmapped images tend to produce "jaggies" or moiré patterns when enlarged or reduced. Also known as a *raster*.

gradient An object fill that changes gradually from one side to the other.

grouping Making several objects part of a logical set that can be resized, rotated, or otherwise transformed.

hatch A series of parallel or crisscrossed lines used to fill a vector object; particularly useful for

differentiating between objects when solid fills are impractical.

interpolation Calculating and drawing the intermediate shapes between two different objects. Instructing a program to interpolate between a square and a circle, for instance, causes it to create a series of squares with increasingly rounded corners.

joining Combining two or more objects into a single object.

node A point on a curve or line where the rate of change in the slope shifts from positive to negative or vice versa.

polygon Any closed shape formed by connected line segments.

polyline A series of connected line segments.

skew To stretch an object diagonally.

spline A mathematically calculated curve, much like a Bezier curve, in which you can change only the location of a node point.

vector graphic An image defined by lines and shapes rather than individual pixels. Vector drawings can be resized without losing clarity or shape.

and convert it to curves, it can be easily manipulated. We used the Rolling Pin tool to create an interesting text effect in our logo. The Rolling Pin allows the designer to grab just one corner of the bounding box and move it, thus distorting the text inside. The text looks flattened and pulled in a specified direction.

The clip art, too, varies in its usefulness. The package comes with a decent selection of images, but they vary in quality. Some contain an inordinate number of elements, making them difficult to manipulate and color; for example, an apparently simple cartoon of a woman contained more than 100 elements. You select the separate images from thumbnails in a paper catalog.

KeyDraw! Plus works natively with GEM, .IMG, and TIFF formats. To import or export more common formats, you'll have to turn to an external conversion utility, an included subset of Inset

Systems' HiJaak. What's more, KeyDraw! doesn't support .BMP, .GIF, and .WMF formats at all, though it does support .DXF files. The printer driver selection is also somewhat limited; none of the HP LaserJet III printers are supported, though we were able to print from the Tektronix Phaser II printer by using the generic color PostScript driver. Other drivers are available, for a price, from Discus Software.

KeyDraw! Plus is a full-featured package, if somewhat hard to categorize. Besides the obvious allure it holds for DOS users, the rich feature set makes it the package to choose if you need high-powered illustration tools at a bargain-basement price. Nonetheless, its status as an orphaned product (don't expect any upgrades, ever) and its limited number of printer drivers and file filters may limit the scope of its appeal as a business illustration tool.

FACT FILE

KeyDraw! Plus, Version 2.01

SoftKey Software Products Inc., 21602 N. Third Ave., Phoenix, AZ 85027; 800-377-6567, 416-602-5500; fax, 416-602-0239

List price: \$79.95.

Requires: 505K RAM, 512K hard disk space, DOS 3.1 or later. Mouse recommended.

In short: DOS-based KeyDraw! Plus packs some high-powered illustration tools at a bargain-basement price. But its orphaned product status and its limited file filters and printer drivers may restrict its usefulness as a business illustration package.



ON READER SERVICE CARD



"A Real Steal"

InfoWorld 9-30-91

"A steal." "A must-have." That's what the experts are calling new Windows Draw. The incredibly affordable, easy-to-use graphics software that lets you add visual impact to *everything* you produce!

You can create your own graphics, or choose from *thousands* of ready-made images, symbols, borders, charts and more. Use Windows Draw to add pizzazz to presentations. New life to newsletters. And flair to flow charts. It's compatible with all your favorite word processing, page layout and other PC programs. So you can add dazzle to just about everything you do!



Make everything you produce look great with dazzling graphics.

Which Would You Buy?		
Illustrator	★★★★★	\$695
Windows Draw	★★★★½	\$149
Professional Draw	★★★★½	\$495
Freehand	★★★★	\$595
Harvard Draw	★★★★½	\$595
Corel Draw	★★★★½	\$695

Publish Magazine June 1992.

(Suggested retail prices.)

"A beautifully designed draw program."

COMPUTE
February/March 1992

"Major Visual Impact, Minor Wallet Damage."

BYTE
January 1992

"This new software offers a serious challenge to the conventional wisdom that high functionality requires high prices. Windows Draw offers a surprisingly full array of drawing tools and functions, an extensive clip-art library, and a truly can't miss interface."

PC Computing
December 1991

"An outstanding bargain."

PC Sources
February 1992

"In fact, the program's drawing and transformation tools rank with the best. You can create text on a path, fancy gradient fills, and blends, not to mention that your drawing can be up to 55 inches square!"

Publish Magazine
June 1992

"Not only is Windows Draw great software, it's also a great bargain!"

PC Publishing & Presentations
February/March 1992

"Add performance that's second-to-none and the unbeatably intelligent and friendly design of Windows Draw's user environment, and you have everyman's illustration program."

Publish Magazine
June 1992

With reviews like these, it's no wonder Windows Draw is the #1 selling PC graphics package in America. Steal a copy for yourself today!

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CIRCLE 311 ON READER SERVICE CARD

► **S U M M A R Y O F F E A T U R E S**

Business Illustration Software



Products listed in alphabetical order

■ = YES □ = NO

	Arts & Letters Apprentice	ComputerEasy Draw	KeyDraw! Plus	KeyDraw! Plus for Windows	Windows Draw 3.0 plus OLE
List price	\$169.00	\$149.00	\$79.95	\$79.95	\$149.95
General					
Interface	Windows	Windows	GEM	Windows	Windows
Total memory required	2MB	2MB	640K	1MB	1MB
Supports expanded memory	□	□	■	■	■
Supports OLE	□	■	N/A	□	■
Workspace management:					
Variable zoom/pan	■ □	■ □	■ ■	□ □	■ ■
User can place elements outside of page	□	■	■	■	■
Maximum number of layers	1	1	Unlimited	1	1
Customizable toolbox	□	■	■	□	□
Drawing and Editing Tools					
Drawing tools:					
Arc/Parabola	□ □	■ □	■ □	■ ■	■ □
Circle/Ellipse	■ ■	■ ■	■ ■	■ ■	■ ■
Freehand curve	■	■	■	■	■
Line	■	■	■	■	■
Polyline/Polygon	■ ■	■ ■	□ ■	■ ■	■ ■
Rectangle/Square	■ ■	■ ■	■ ■	■ □	■ ■
Rounded corners	■	■	■	■	■
User-controlled	□	■	□	□	□
Curve-editing options:					
Move nodes	■	■	□	■	■
Insert or delete nodes	■	■	□	■	■
View control points	■	■	■	■	■
View active tangents	■	■	■	□	■
Automatic curve smoothing	■	□	■	■	■
Object manipulation:					
Align to baseline/page	■ ■	□ □	□ □	■ □	□ ■
Break or combine at node/cursor	□ □	□ □	■ ■	■ □	■ □
Convert to polygons/curves	□ ■	■ ■	■ ■	■ ■	□ ■
Copy object attributes	■	□	■	■	□
Duplicate/Mirror	■ ■	■ □	■ ■	■ ■	■ □
Flip horizontally/vertically	■ ■	■ ■	■ ■	□ □	■ ■
Interpolate	□	■	□	□	■
Rotate:					
Freehand/Specifying angle via dialog box	■ □	■ ■	□ ■	□ ■	■ □
Skew or shear	■	■	■	■	■
Snap to grid/baseline	■ □	■ □	■ ■	■ ■	■ □
Special effects:					
Stretch	□	□	□	■	□
Warp/Extrude	□ □	□ □	■ □	■ □	□ □
Apply effects to objects/editable text	■ ■	□ □	■ □	■ ■	□ □
Lines, patterns, and fills:					
User-definable	■	■	□	■	□
Includes arrowheads	□	■	■	■	■
Predefined hatch patterns	6	5	None	5	6
Edit patterns/Store new patterns	□ □	■ ■	N/A	■ □	□ □

N/A—Not applicable: The product does not have this feature

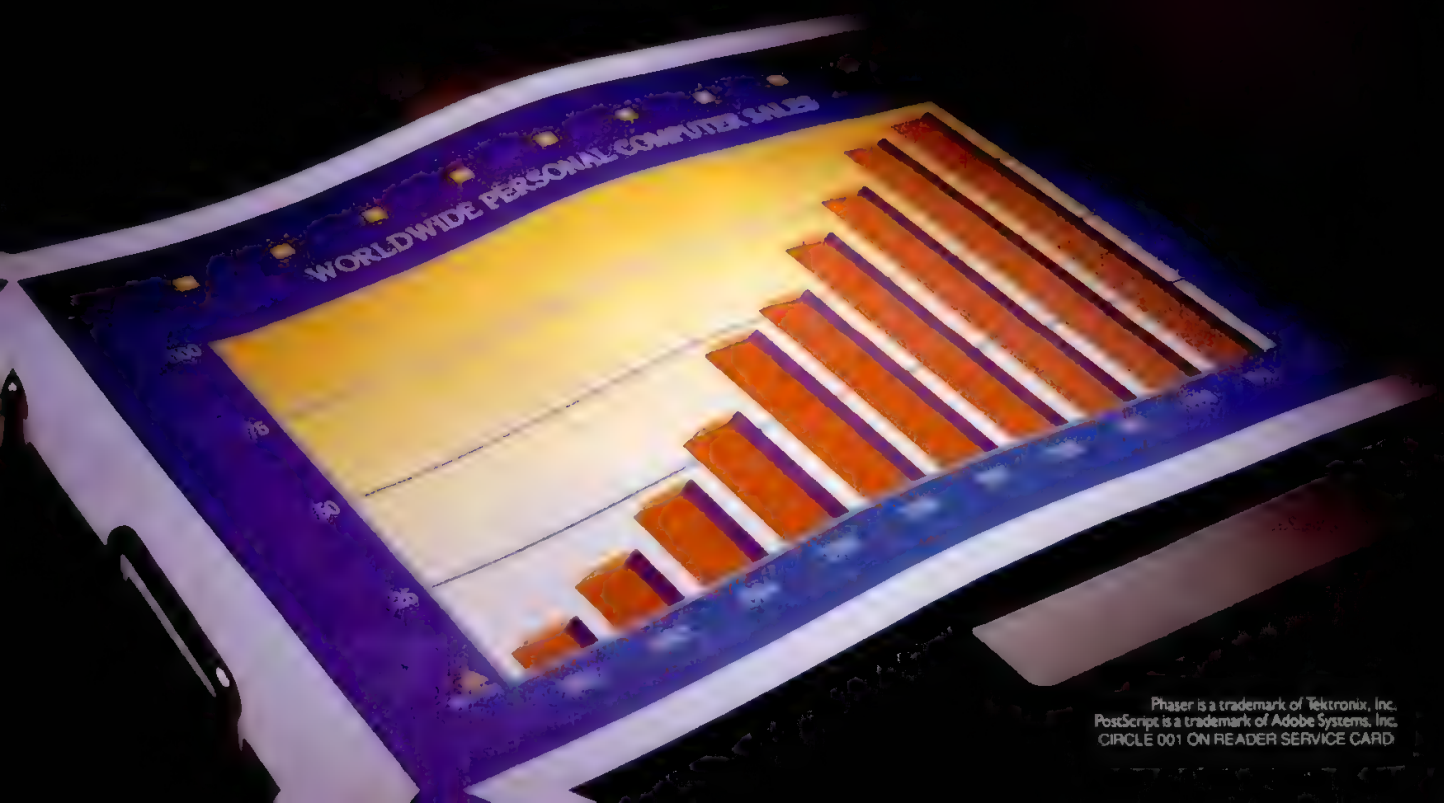
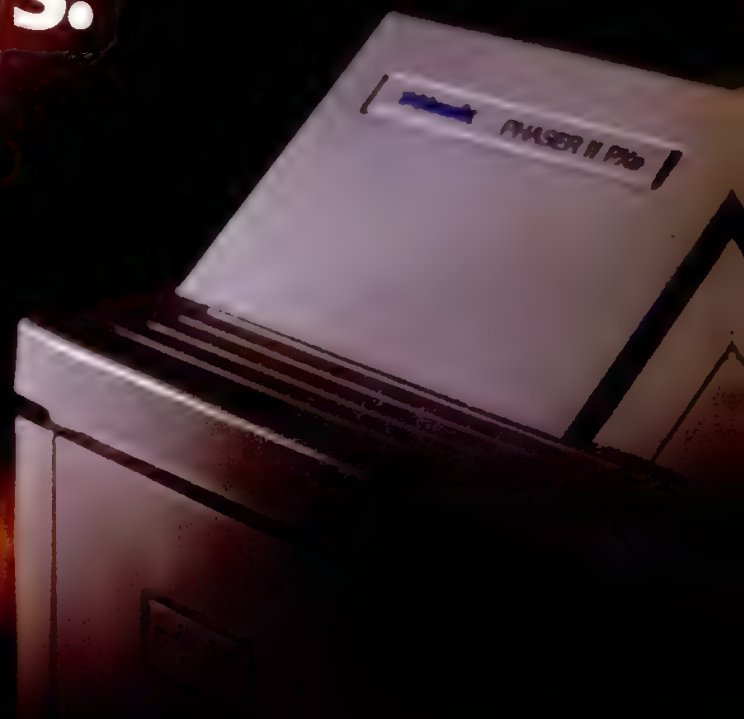
CONTINUES

Rich color isn't just for rich guys.

The Tektronix Phaser™ II PXe color printer produces 16.7 million of the world's brightest, most vivid colors. It has a 16 MHz RISC processor on-board so it's as fast as you are. It supports Adobe PostScript Level 2 and HP-GL, it's networkable and can perform with PCs, Macintosh and workstation applications. It prints especially well on transparencies, too. And at less than \$5000, you get an award-winning printer with all the latest features at an extremely affordable price. Call the leaders in color printing at 1-800-835-6100 Dept. 26E for a free output sample. Or call (503) 682-7450, ask for Document 1215 and we'll send information by fax. And get the color you need. At a price you can afford.

Tektronix

Computer Graphics



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CORELDRAW 3.0

THE FIRST ALL-IN-ONE GRAPHICS SOFTWARE

In the information-packed '90s, good graphics are more important than ever to get your message across quickly and effectively. And now it's easier than ever to use graphics — with CorelDRAW 3.0! Everything you need is in one value-packed box. There is no longer any need to buy separate illustration, charting, painting, and presentation

packages. CorelDRAW 3.0 does it all with unmatched power and ease-of-use! And, as an unprecedented bonus, Corel has included a CD-ROM with over 14,000 clipart images and over 250 fonts! You'll get fingertip convenience for software that would otherwise occupy over 500 floppy disks and cost thousands of dollars.

Outstanding Reviews!

"CorelDRAW remains the easiest-to-use graphics product on the market...the ultimate graphics bargain!"

PC Magazine, August, 1992

"CorelDRAW — ALL THAT MOST PEOPLE WILL EVER WANT in the way of a graphics software..."

William D. Marrel, Windows Magazine, July, 1992

"Business users who need a wide variety of graphics functions shouldn't pass up this package. It is an amazing bargain."

Luise Simone, PC Magazine, August, 1992

"CorelDRAW 3.0 is without doubt the most powerful, feature-laden, and best value for money graphics systems for Windows, at any price point. Full stop, end of discussion."

Jon Noneyball, Windows Magazine UK, August, 1992

"Endowed with paint, chart and presentation capabilities, this upgrade of the leading PC draw package is a stunning example of increased power at a reduced price."

Christina Wood, PC WORLD, July, 1992

"It's hard to find a more value-laden offering. We rate the value as excellent."

Mike Heck, INFOWORLD, July 13, 1992

"Total relative value of CorelDRAW modules, clipart and fonts is \$15,000."

John Butler, Seybold Report on Desktop Publishing, July, 1992

"CorelDRAW is a phenomenal bargain."

Michael Burgard, PC/Computing, July, 1992

\$595



Outstanding Value!

Other companies need several packages to do what Corel does in one!

Company	Drawing/ Illustration	Charting/ Presentation	Photo- Editing	Fonts	Clipart	Total Cost
Micrografx	Designer	Charisma	Picture Publisher	251	9300	\$1685
Software Publishing Corporation	Harvard Draw	Harvard Graphics Windows	Not Available	62	1600	\$1190
Aldus	Freehand	Persuasion	PhotoStyler	12	305	\$1885
Corel	CorelDRAW*	CorelDRAW*	CorelDRAW*	256	14,000	\$595

No wonder CorelDRAW is the world's best selling graphics software for Windows!

CORELDRAW!

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FREE 24 hour Technical Support

CorelDRAW is **MULTIPLATFORM** for corporate standardization: Windows, OS/2, UNIX. And soon available on the MAC, and in 20 languages!

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► SUMMARY OF FEATURES

Products listed in alphabetical order



■ = YES □ = NO

	Arts & Letters Apprentice	ComputerEasy Draw	KeyDraw! Plus	KeyDraw! Plus for Windows	Windows Draw 3.0 plus OLE
Drawing and Editing Tools (continued)					
Predefined bitmap patterns	222	60	None	None	27
Edit patterns/Store new patterns	□□	■ ■	N/A	■ □	■ ■
Type Handling					
On-screen editing	■	□	□	□	■
Convert text to curves	■	■ (Adobe Type 1 only)	■	□	■
Wrap text around curved path	■	■	■	■	■
Align text to baseline	■	□	□	■	□
Indent text	□	□	□	□	■
Justify text	■	■	■	□	■
Fit text to box/box to text	■ □	■ □	□ □	□ □	□ □
Adjustable leading	■	□	■	□	□
Adjustable tracking	■	□	□	■	□
Adjustable kerning	■	□	□	■	□
Font support:					
Font types used	Proprietary	Proprietary, TrueType, Type 1	Proprietary	Proprietary	Bitstream, DTC, URW
Number of typefaces supplied	27	24	25	36	38
Range of point sizes	1-2,000	2-200	2-500	2-500	Windows-dependent
Third-party soft fonts supported:					
Adobe Type 1	■ (through ATM)	■ (through ATM)	■	■ (through ATM)	■ (through ATM)
Bitstream (Fontware/Speedo)	■ ■ (through FaceLift)	□ □	■ ■	■ □	■ ■ (Speedo through FaceLift)
TrueType	■	■	□	□	■
Printer-based fonts:					
HP cartridge/PCL soft fonts	■ ■	■ ■ (through Windows)	■ □	■ □	■ ■ (through Windows)
PostScript fonts	■	■ (through Windows)	■	■	■ (through Windows)
Color Handling					
Gradient fills:					
Horizontal/Vertical	■ ■	■ ■	■ ■	■ ■	■ ■
Angled/Radial	■ ■	■ ■	■ ■	■ ■	■ ■
Maximum colors:					
In total palette	16.8 million	256	16.8 million	16.8 million	16.8 million
Displayable on-screen (undithered)	16.8 million	256	16	16	16.8 million
Color models supported:					
CMYK	■	■	■	■	□
HSL	■	□	■	■	■
PMS (Pantone)	□	□	■	■	□
RGB	■	■	■	■	□
File Import and Export					
Bitmap formats (read/write):					
.BMP (DIB)	□ □	■ ■	□ □	□ □	■ ■
.GIF	□ □	■ □	□ □	□ □	□ □
.PCX	□ □	■ □	■ ■	■ ■	■ ■
TIFF	■ ■	■ □	■ ■	■ ■	■ ■
Indexed	■ ■	□ □	□ □	□ □	■ ■

N/A—Not applicable: The product does not have this feature.

CONTINUES

► SUMMARY OF FEATURES

Products listed in alphabetical order

■ = YES □ = NO



	Arts & Letters Apprentice	ComputerEasy Draw	KeyDraw! Plus	KeyDraw! Plus for Windows	Windows Draw 3.0 plus OLE
File Import and Export (continued)					
Vector formats (read/write):					
CGM	□ ■	■ ■	■ ■	■ ■	■ ■
GEM	□ □	□ □	■ ■	□ □	■ ■
.PIC (Lotus)	■ □	□ □	■ ■	□ □	□ □
.WMF	■ ■	■ ■	□ □	□ □	■ ■
.WPG (WordPerfect Graphics)	□ ■	□ □	■ ■	□ □	■ ■
PostScript support:					
Write EPS only	■	□	■	■	■
With TIFF/with .WMF	■ ■	□ □	■ □	□ □	■ □
AI (editable EPS) import/export	□ ■	□ □	■ ■	□ □	■ ■
Clip-art images included:					
Number of images	3,500	400	192	500	2,600
Supplier	Computer Support Corp.	ComputerEasy International	Multivendor sampler	SoftKey Software Products	Micrografx
Format	.GED	.VDR	Various	.GWX	.DRW (Micrografx)
Paper catalog/Cataloging software	■ ■	□ □	■ □	■ □	■ ■

Output Options

Printers supported	Any Windows device	Any Windows device	HP through LaserJet Series II	HP-compatible	Any Windows device
Print multiple images per page	■	□	■	■	□
View page	■	□	■	■	□

Documentation and Support

On-line help	■	■	□	■	■
On-line tutorial	■	□	■	□	□
Paper tutorial	□	■	■	■	■
Sample files included	■	□	■	■	■
Toll-free technical support	□	■	□	□	□
Technical support hours (eastern time)	9:30-7:30 M-F	10:00-7:00 M-F	9:00-8:00 M-F	9:00-8:00 M-F	24 hours M-F, 9:00-6:00 weekends
BBS	■	□	□	□	■

ENDS

SoftKey Software Products Inc.

KeyDraw! Plus for Windows

BY ANGELA GUNN

KeyDraw! Plus for Windows, from SoftKey Software Products, bears almost no resemblance to its sister DOS product apart from its \$79.95 bargain price and its inability to be categorized. This, too, is an in-between package: On the one hand, it packs an impressive collection of graphing tools and below-par illustration capabilities; at the same time, it is targeted to business illustration users. What it most closely resembles is Tilcon Software's GraphicWay, which (at a higher price) bills itself as presentation graphics

software. What KeyDraw! Plus for Windows needs is a serious push in one direction or the other.

You'll need a lot of patience to work with this product. Though there are icons for drawing primitives, including several unusual ones such as trapezoids, parallelograms, and rhomboids, there are no icons for text or coloration. You can ap-

ply fill colors, gradients, or patterns only after you have drawn an object.

KeyDraw! Plus for Windows is touchy about how you construct images, too: You have to make your changes in a particular order. In testing, we drew a line and then wanted to change its color and width; only by changing the color first could we make both changes. A widened line simply would not recolor. Grouping and moving items can also prove frustrating. When we tried to group all the elements on the pizza in our logo test, the package grouped the pepperonis, but it refused to group the underlying cheese.

Using the included clip art is no picnic, either. There is a sizable collection of floor plans and electrical symbols but not much in the way of useful business im-

SUITABILITY TO TASK				
KeyDraw! Plus for Windows	POOR	FAIR	GOOD	EXCELLENT
Basic illustration	●	●	○	○
Type handling	●	○	○	○
Color handling	●	●	○	○
Business presentations	●	●	○	○

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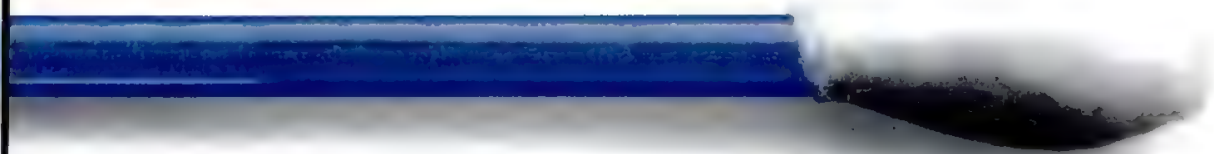
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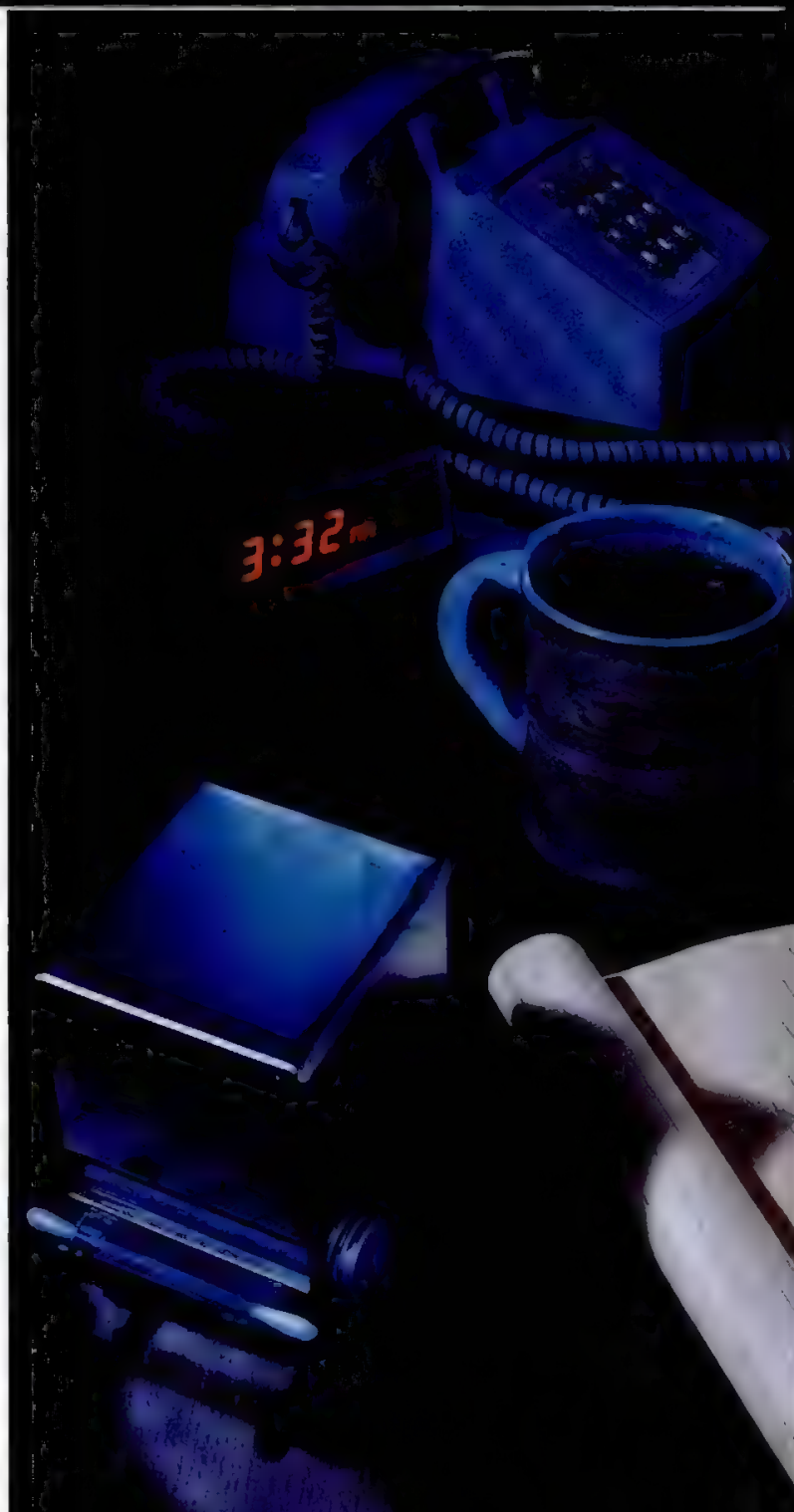
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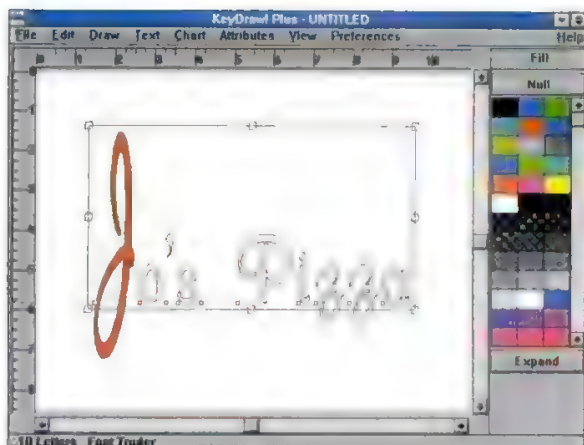
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While KeyDraw! Plus for Windows will not let you import text, it will let you change the shape of letters by repositioning their "hooks."

ages. Many of the images are poorly drawn and difficult (though not impossible) to manipulate. Other images appear in the printed directory but are nowhere to be found on-disk.

TESTING WOES

KeyDraw! Plus for Windows does not allow you to import blocks of text, so you'll have to type it in manually. Be warned, though: It accepts text input only to the limits of the screen, and it does not accept hard returns in a text block. Once you've entered text, you can create some interesting effects, such as extrude and envelope. The package gives you "hooks" for manipulating letters individually. Disconcerting at first, this feature works out well if you want to adjust kerning or character placement manually. The package also offers a good range of type styles,

including a few interesting proprietary display faces.

The package imports only CGM, .PCX, and TIFF files. Because of this, we were unable to import a .WMF-format pie chart and several other files. We could, however, duplicate the chart using the package's own graphing capabilities.

Key Draw Plus! for Windows includes a whopping 110 chart templates for instant graphing. The chart options are also impressively varied: area charts, bar charts, line charts, scatter

charts, pie charts, and still others. In case you don't know which chart type to use, the documentation offers hints for matching your data to an appropriate format. It can import ASCII, delimited ASCII, dBASE, .DIF, and Lotus files and RipCam spreadsheets, or you can input data onto a simple grid-style form.

Output is equally commendable. The package supports all the most popular printers and did a respectable job of printing. What we saw wasn't necessarily what we got: The output was usually better. The pizza crust in our logo was presented on-screen as a ragged, broken ellipse, but the printout displayed an unbroken, pleasantly irregular shape. KeyDraw! Plus for Windows also has an interesting slide-show option that lets you specify how long each slide will be displayed. You can add and manipulate slide-show titles on-screen and add special wipe effects to jazz up the transitions.

While it is hard to fault a product for not being something else, the point has to be made: KeyDraw! Plus for Windows is not a low-cost illustration package but an inexpensive and relatively easy-to-use charting package. Yet the best shoe still makes a poor hat, and KeyDraw! Plus for Windows, no matter how proficient at charting, makes a poor illustration package. Unless what you really need is a low-cost charting package, look elsewhere.

Micrografx Inc.

Windows Draw 3.0 plus OLE

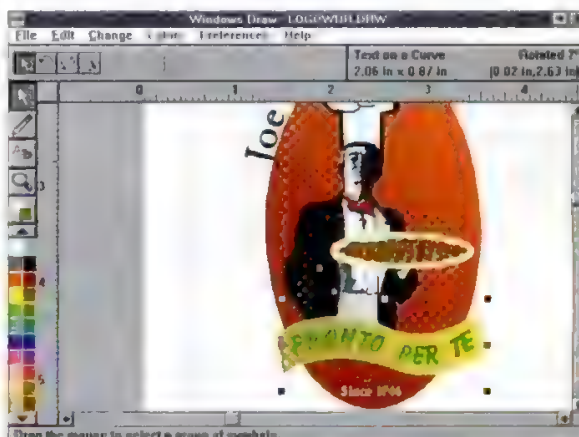
BY ROCK MILLER

Praise is always in order when a low-priced product turns out to be as well built as its luxury-class counterparts. That is certainly the case with Micrografx's \$149.95 Windows Draw 3.0 plus OLE—a much-improved descendent of Draw Plus, recently enhanced for Microsoft Windows 3.1 with OLE server support and 18 TrueType fonts. This simple

SUITABILITY TO TASK				
Windows Draw 3.0 plus OLE				
	POOR	FAIR	GOOD	EXCELLENT
Basic illustration	●	●	●	●
Type handling	●	●	●	○
Color handling	●	●	●	●
Business presentations	●	●	●	●

but well-honed program is a remarkably good value as well as a solid tool for basic drawing tasks.

Previous Micrografx products were known for their overabundance of separate tools, but Windows Draw represents an admirable break with this tradition. Its clean two-panel design is well organized and easy to understand, packing plenty of power without a lot of on-screen clutter. The program comes with an intelligent selection of drawing tools, including both a conventional freehand curve tool and a sketch tool that converts your scribbles into editable Bezier curves. These, like the rotation and skew/slant tools, are



Windows Draw 3.0 plus OLE's ability to fit text to a curve is first-rate. The text remains separate and editable after binding.

FACT FILE

KeyDraw! Plus for Windows, Version 3.0

SoftKey Software Products Inc., 21602 N. Third Ave., Phoenix, AZ 85027; 800-377-6567, 416-602-5500; fax, 416-602-0239

List price: \$79.95

Requires: 1MB RAM, 3MB hard disk space, Microsoft Windows 3.x

In short: KeyDraw! Plus for Windows is a charting package trying to pass itself off as a business illustration package. While the price is low, the illustration tools work with varying degrees of success and do not qualify this product as a bargain

ON READER SERVICE CARD

■ Drawing with Words

by Lori Grunin

Long ago, people drew pictures on cave walls to communicate with each other. Now, with the aid of computers, we take our millennia-old alphabets and turn them back into pictograms. The tools in text-effects packages such as Adobe TypeAlign, Bitstream's MakeUp, and Power Up Software Corp.'s TextAppeal for Windows let you merge words with pictures to jazz up your signs, fliers, and newsletters.

Most illustration packages, whether for novice or professional, allow you to manipulate text in some basic (and usually unsatisfying) ways, such as by fitting it to a user-defined path. The undisputed master at contorting your words is CorelDRAW, which lets you extrude, warp, and blend text, among other capabilities. And the features aren't the entire story. For instance, if you extrude text into a three-dimensional object, not only does the text remain active, but if you edit the text, CorelDRAW automatically recomputes the extrusion to include the edits.

Using CorelDRAW for simple text effects, however, can be like using a sledgehammer to crack a walnut. It's the most expensive solution (\$595), it supports only TrueType and .WFN (Corel's own format) fonts, and it currently occupies a whopping 20MB of hard disk space. If a powerful but bulky behemoth isn't the right solution for you, a more specialized package may be the answer.

A ONE-TRICK PONY

Of the three text-effects packages, Adobe TypeAlign (\$99; Adobe Systems Inc., Mountain View, California; 800-833-6687) offers the most basic feature set. You create a path—linear, circular, or Bezier—and enter text directly on it. You can control character attributes, kerning, and rotation, and you can move a text object in front of or behind other text objects.

While this may seem a limited set

of capabilities, the product is easy to use, and you can produce a surprising number of attractive effects. TypeAlign works only with Type 1 fonts, but this is not as big a drawback as the lack of OLE support.

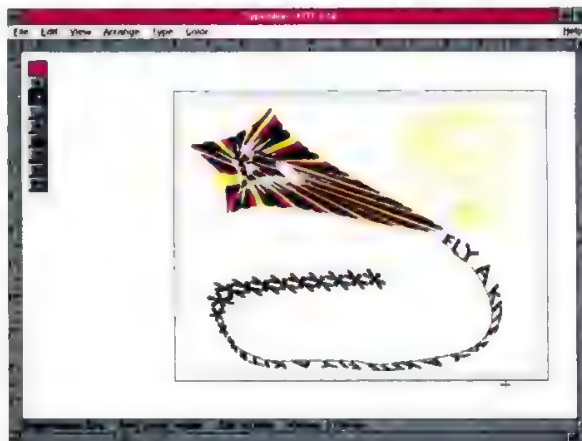
PHILOSOPHICAL DIFFERENCES

The design philosophy of MakeUp (\$149; Bitstream Inc., Cambridge, Massachusetts; 617-497-6222) and TextAppeal for Windows (\$99.95; Power Up Software Corp., San Mateo, California; 415-345-5900) sets them apart from TypeAlign in several important ways. These two products come with large sets of predefined effects for quick-and-dirty text manipulation, and both supplement their text-effects capabilities with similar excellent sets of drawing tools. In addition, both can work with TrueType as well as Type 1 fonts. Yet the implementations feel quite different.

With TextAppeal, for instance, you type your text directly on a linear (perspective or nonperspective), Bezier, or arced path. But in MakeUp (as in CorelDRAW), you type your text first, and then apply effects such as warping, extruding, or fitting it to a curve or within a predefined geometric shape, which you can warp further.

TextAppeal seems geared toward easy replication of predesigned effects, while MakeUp stresses ease of initial creation. TextAppeal lets you create a library of custom tools, which can be entire drawings or simple logos; when you use a custom tool, it pastes the drawing into your current workspace. So, for instance, you can create a custom tool consisting of three parallel lines of type rotated to a 45° angle sandwiched between two lines of type fit to

the upper and lower halves of a circle. To enter the text *du jour*, you merely alter the existing text. This is a much simpler and more elegant solution than importing old drawings, and Text-



TypeAlign has no drawing tools, but with a little creativity you can create illustrations composed solely of text.

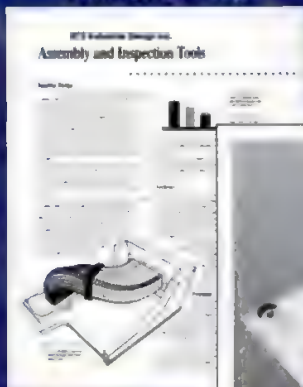
Appeal comes with more than 50 predefined custom tools to start you off. MakeUp, by contrast, provides a set of 44 predefined shapes that you can fit text into; you can also create your own shapes and save them to the library.

MakeUp is the most ambitious of the three packages. But the bigger they are, the harder they fall. This one tries to emulate CorelDRAW but takes shortcuts in many of its tools that make achieving attractive results difficult. For example, it embosses by creating two different-color duplicates of the text and offsetting them from the original at user-defined distances. This method makes it terribly difficult to get any perceptible depth in an emboss, and after a point all those offsets just get messy. And once you have applied many of the effects, your text becomes uneditable. But MakeUp is the only package of the three to support OLE.

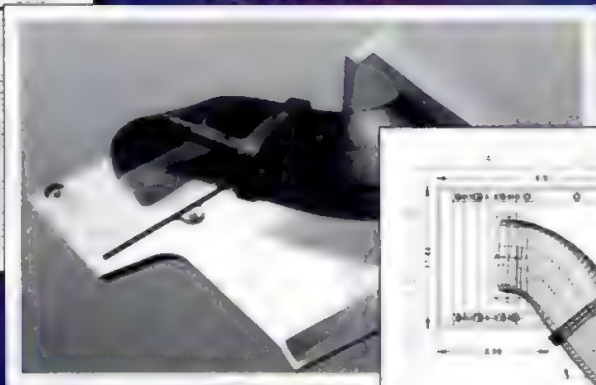
All three text-effects packages offer something beyond what comes in business illustration products. And they don't break your back or your budget. □

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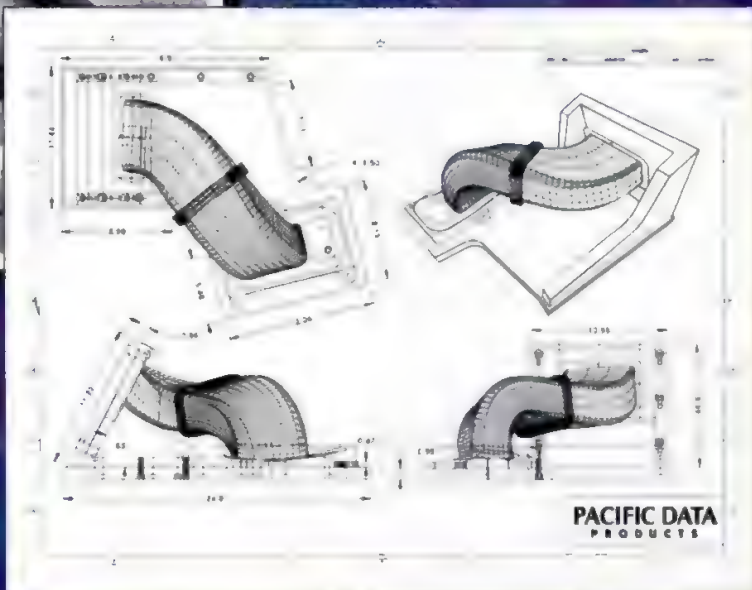
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■ Drawing by Numbers

by Rock Miller

Computerized drawing tools are a god-send for creating complex illustrations, but changing the results extensively often takes as much work as producing them did. If you've had to struggle on deadline to re-create elements that just couldn't be adapted to your revised wishes, parametric drawing is a technology that promises to make this process less painful. The idea is essentially to create intelligent computer models that embody information about object relationships, so that you can change, reshape, and reuse them.

Parametrics has become an established technology on sophisticated workstation-based CAD systems (especially those used for mechanical design), and they are beginning to appear in PC-based CAD packages (most notably Ashlar's Vellum for Windows). Now Aldus Corp.'s IntelliDraw, released in June of this year at \$395, brings the benefit of parametrics to illustration programs. The purpose of this product is to produce two-dimensional paper drawings rather than to create specifications for three-dimensional objects.

IntelliDraw supplies three critical parametric capabilities. First, the values that determine the size, position, and other characteristics of drawing objects are open and accessible, allowing you to size objects precisely "by the numbers." Second, you can define

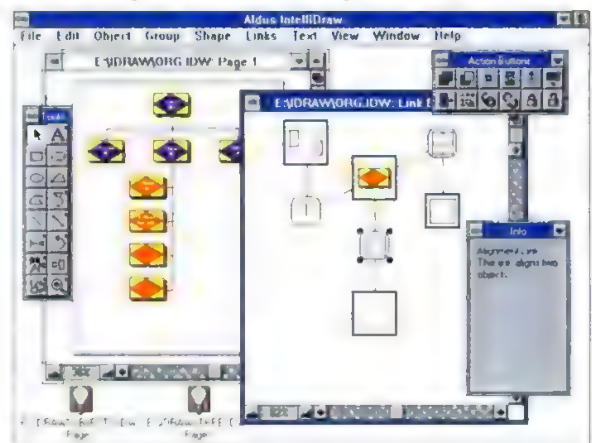
complex relationships between objects—alignments, connections, and distributions—in a similarly precise way, so that objects can reshape themselves intelligently as you move, resize, and otherwise transform them. Finally, you can link objects to common masters to make changes easily to many elements throughout a drawing.

These capabilities are tremendously useful in a wide range of precision drawing tasks. They are suitable for office plans, facilities layouts, and other space-planning jobs that have often been the province of low-end CAD packages. They are also excellent for generating diagrams, from simple organizational charts to complex network flowcharts. Unlike conventional org-charting software, a parametric drawing package gives you complete flexibility in layouts and elements and intelligent connectors that reconfigure themselves as you move these elements around.

INNOVATION AND FRUSTRATION

IntelliDraw is an ambitious package. Its auto-align feature pops up guide-

lines as you draw, letting you snap objects into key alignments (edge to edge, center to center, top to bottom, and so forth) as you draw. You can lock these alignments into place as you go, and more complex alignment tools let you define persistent relationships—for instance, to specify that a piece of machinery should always be placed a given distance from a wall, or to distribute chairs evenly around a conference



Thanks to IntelliDraw's ability to link objects together dynamically, it is ideal for creating flowcharts and organization charts.

table. Any object can be made into a symbol master in a single simple operation, and you can group multiple objects into "flip-books" so that you can call up multiple variants of, say, chairs, simply by clicking.

IntelliDraw's CAD-like features (which include the ability to layer drawings) make it appropriate for

predictable and easy to use. In addition, the node-editing and smoothing tools make fine-tuning a snap.

Don't let this simplicity deceive you: Windows Draw packs some sophisticated capabilities. The program offers customizable gradient fills, for which you can specify the starting point and rate of change as well as the colors; these are excellent for producing shaded effects, such as the one used on the man's coat in our test logo. The program supports a full complement of 16.8 million colors, and thanks to its simple but robust color-

handling controls, you can easily create and save your own color palettes.

The interface does have a few blemishes, though. You can't access many frequently used manipulations, such as alignments and grouping (used heavily in our flowchart diagram), from the toolbox. Also annoying is the excessive mousing around required to change fill colors, especially if they involve hatch patterns or gradients. Fortunately, the menus show your most recent fill and line combinations, which takes some of the edge off these imperfections.

NOTHING FANCY

Windows Draw's text facilities are basic, but they get the job done. You can't perform fancy extrusions or cutouts, but you can stretch and rotate text just as you would manipulate any other object, and you can convert it to editable curves for more elaborate effects (a trick that works with Type 1 and TrueType fonts). The high-quality text-on-a-curve feature lets you bind text to a curve without incorporating the curve object into the editable text object, a feature that came in handy when it was time for us to create the ellip-

technical drawing tasks. You don't work directly in real-world measurement units, as you would in CAD systems, but you can define a scale for your drawing (for example, 1 inch = 100 feet) and then enter all measurements directly in the same scale units. You can link objects to other objects so that they resize together, and the product's associative dimensioning abilities ensure that the dimensions adapt automatically as you resize objects, and vice versa.

The program is at its most interesting when it uses parametrics internally to make ordinary drawing tasks more powerful. Its Symmetricon tool, for instance, provides a slick way of drawing symmetrical objects; you simply sketch out one profile, and the system generates the other profile for you. Unlike ordinary mirror tools, the symmetrical relationship remains "live." The Connectigon is another such space-age tool; it lets you glue together two shapes into a perspective representation that is smart enough to reconfigure itself properly when you resize or reshape it. These tools are light-years away from the simple mirror and skew operations that conventional drawing programs offer, and they make IntelliDraw useful for far more than just technical drawing.

Despite the product's jaw-dropping technical wizardry, the experience of actually using IntelliDraw is not what you would call pleasant. The program's interface may be a little too advanced for its own good. Between the numerous multilevel icons on two floating toolbars and the multistep double-click operations—which do different things

tical background of our logo.

Paragraph features are weak, however: There is no way to control text leading or word spacing directly, and there is no way to set tab stops. Indenting works only on word-wrapped text lines. You can import text blocks from ASCII files, but there is no easy way to split them into separate lines; for this reason, we had to type in the lines manually in our annotated pie chart test.

Windows Draw's large clip-art collec-

tion is far more commendable. It includes 2,600 high-quality Micrografx images, and although the selection is a bit repetitive in some cases and perhaps not detailed enough in others, on the whole it's a good value. A well-designed on-line catalog lets you search for images by keyword and then preview them. You need not install all the clip art to do this: The program prompts you for disks if you select an image that is not already installed.

This first version of IntelliDraw has some rough edges (notably in color and font handling). And although the introductory video does a good job of showing you the possibilities of the program, and a handy "info window" tells you what is going on as you work, the manual is skimpy and the help system downright inadequate. Finally, all this linking and updating consumes an extravagant amount of computer power: The program proved unbearably sluggish on our standard 25-MHz 386 test-bed and became truly usable only when we switched to a 33-MHz 486.

IntelliDraw will soon have competition. Shapeware Corp. has its own parametric drawing package, which we saw in a beta version. The company expects to release it sometime this fall.

Parametric drawing packages are not entry-level business tools. The skill and forethought required to set up the links that represent the true essence of IntelliDraw's power ensure that the effort will hardly be worthwhile for one-time projects. And the necessarily complex nature of the package ensures that only those who can afford the time to master its power will gain much benefit from its advanced features. For those who do find it worthwhile, however, IntelliDraw brings computer-assisted drawing to a new level. The current implementation is still in its infancy, but keep an eye on future implementations of this powerful concept. □

tion is far more commendable. It includes 2,600 high-quality Micrografx images, and although the selection is a bit repetitive in some cases and perhaps not detailed enough in others, on the whole it's a good value. A well-designed on-line catalog lets you search for images by keyword and then preview them. You need not install all the clip art to do this: The program prompts you for disks if you select an image that is not already installed.



FACT FILE

**Windows Draw 3.0
plus OLE**

*Micrografx Inc., 1303 Arapaho,
Richardson, TX 75081; 800-733-3729,
214-234-1769; fax, 214-994-6334*

List price: \$149.95

Requires: 286-based PC or better, 1MB RAM (2MB recommended), VGA graphics adapter or better, DOS 3.1 or later, Microsoft Windows 3.x

In short: This solid all-around package is notable for its basic but well-selected drawing tools. Its wide range of quality clip art, 19 TrueType fonts, and comprehensive set of file imports and exports make it a remarkable value as well.



ON READER SERVICE CARD

Equally impressive is the program's unusually comprehensive collection of file import and export capabilities; this is a legacy of its professional cousins, Micrografx Designer and Charisma (with which it shares its native .DRW format, supported directly by Aldus PageMaker and several other programs). Its technically sophisticated filters let you both read and write editable EPS files, as well as the many important flavors of CGM and a host of less common formats. Windows Draw can also place bitmapped images in .BMP, .PCX, or TIFF format, though it cannot rotate the images or make them transparent. Although our tests uncovered a few glitches, including some minor alterations in hatch attributes in CGM exports and the loss of gradients in the process of importing editable EPS files, we were generally pleased with the results.

The package has an occasional tendency to redraw the screen unnecessarily, but it prints quickly, especially when using Micrografx's enhanced PostScript driver. The drawing screen takes its sizing from the printer driver and adapts itself cleanly to different form sizes and orientations.

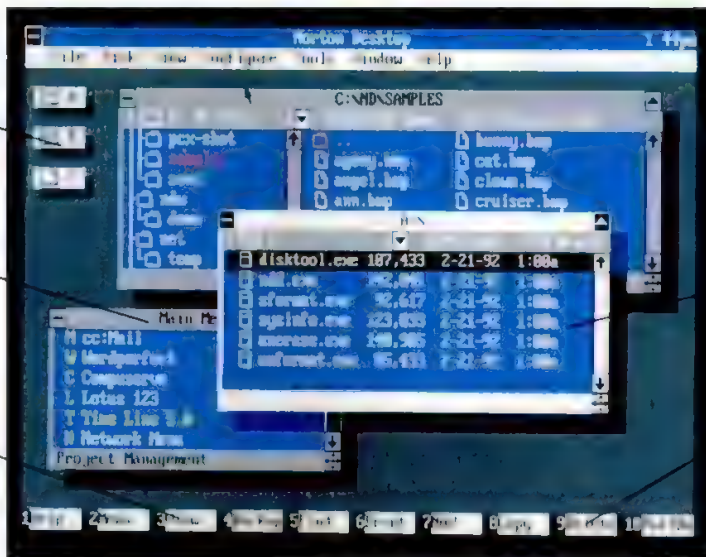
Although Windows Draw 3.0 plus OLE may be inexpensive, it is far from cheap. It handles with aplomb the important work of programs costing three times as high, and it yields illustrations equally high in quality. No Windows user with an interest in graphics should be without this versatile toolkit. □

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CIRCLE 186 ON READER SERVICE CARD

SYMANTEC.

Programming

UTILITIES

Keep Your PC's Clock Right to The Second with WTIME

BY JOHN DEURBROUCK

Does your computer know what time it is? Unfortunately, the battery-powered clocks in 286s and later PCs tend to lose time, and inaccurate DOS date/time stamps can make it hard to track the changes made in files. Since programmers' MAKE utilities use the date/time stamp to control compilation, an incorrectly set clock can cause modified program files to be ignored. And of course, if you rely on a Windows clock that's off by more than a few minutes, you may be late for your next meeting.

WTIME, this issue's free utility, puts your machine's time clock right on the money. Run under Windows 3.x (or under OS/2's Windows implementation), WTIME uses your modem to synchronize the clock in your PC with that of the Automatic Computer Time Service (ACTS), which is maintained by the National Institute of Standards and Technology. With a click of the mouse, a call taking less than 1 minute will ensure that your date/time stamp is accurate. If you wish, you can even have WTIME make the call automatically each time you bring up Windows.

The easiest way to get a copy of WTIME.EXE is to download it from PC MagNet, as explained in the sidebar "Utilities by Modem." You can download WTIME.EXE, WTIME.HLP, the source code and documentation archived as WTIME.ZIP, or the self-extracting archive WTIM.EXE, which contains just the files necessary to run WTIME. The C source code is also available from PC MagNet. To recompile the code, you'll need Microsoft Quick C for Windows, Version 1.0; Microsoft C++, Version 7.0; Borland C++, Version 3.0; or Borland's

Turbo C++ for Windows, Version 1.0.

You can also get a copy of the executable program file and its source code on disk, without charge. Just send a postcard specifying the program name and desired disk format, plus your name and address, to the attention of Katherine West, Utilities, *PC Magazine*, One Park Ave., New York, NY 10016. Or you can fax your request to 212-503-5799. No phone calls, please.

Inaccurate date/time stamps on files are endemic when using CMOS clocks, but now you hold the key to atomic accuracy.

USING WTIME In order to install WTIME, you will need to copy two files—WTIME.EXE and WTIME.HLP—into a directory where Windows can find them. You can run WTIME with Windows' File Run command in the Program Manager, or you can add WTIME to a Program Manager group by using File New. Note that if you later decide that you want to run the program every time you load Windows, you simply need to change the WTIME on the command

line to WTIME automatic.

When started, WTIME displays a conventional window with three submenus: File, Modem, and Help. The first time you use the program you must begin by selecting Modem Setup, which allows you to configure WTIME. (The Modem Call and Modem Hangup options are initially grayed out.) I'll discuss the configuration process below, but since it takes longer to describe than to do, let me start with how WTIME works once your modem is ready to use it.

Setting the time could hardly be simpler: When you select Modem Call, WTIME does the rest. If you have an external modem, you can monitor the program's progress by watching your modem's lights. In any case, you'll see the succession of messages that WTIME puts up in its window ("sending escape sequence," "looking for data," and so on). And if you keep Windows' CLOCK visible at the same time, you'll shortly see it jump to the correct time at the instant WTIME sets it. WTIME will then automatically send an escape sequence in order to terminate the call.

While a call is in progress, you can cancel it at any time by selecting Modem Hang Up. Selecting File Exit (the only option under the File menu heading) or double-clicking the system menu will shut down the program; if a call is in progress, WTIME will not exit until the modem is properly reset.

When using WTIME, you may notice one minor bug in Windows 3.1's CLOCK. If the digital clock display is active and the time shifts from an hour that has two digits (for example, 10:02) to one with one digit (such as 9:59), CLOCK does not always erase the leading digit. Thus, in this case, the display may end up reading

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19:59! Just resize the window slightly to force a redraw and the superfluous digit will disappear.

SETTING UP WTIME The Modem Setup dialog box, shown in Figure 1, lets you configure WTIME for your time zone, daylight saving time preference, dial string, and COM port.

WTIME's time zone setting, including (when applicable) an X in the Daylight Savings Time box, reflects the difference between your local time and the Greenwich mean time (GMT), which the ACTS reports. The menu choices—eastern, central, mountain, and Pacific—cover most readers' locales. Saving your choice changes the TimeOffset entry in the [WTime] section that WTIME creates in your WIN.INI file. The TimeOffset entry simply expresses the number of minutes by which your time zone differs from that of the GMT.

If you don't live in one of the pre-programmed time zones, you can still use WTIME by changing the TimeOffset number in WIN.INI with a text editor. Newfoundland, for example, is 90 minutes in advance of eastern time. Since the EST TimeOffset is -300, setting TimeOffset to -210 configures WTIME for Newfoundland. Similarly, Alaska's TimeOffset is -540 (60 minutes behind Pacific time's -480), and Hawaii's is -660 (3 hours, or 180 minutes, behind Pacific time). With manual editing you can also intentionally set your clock a bit slow or fast. The central time zone's normal TimeOffset, for example, is -360. If you wanted to set the clock on your PC to run 5 minutes fast, all you would have to do is set TimeOffset to -355.

Valid values for TimeOffset range from -1439 (23 hours 59 minutes before the GMT) to 1439 (23 hours 59 minutes after the GMT). Since several states and locations outside the United States do not observe daylight saving time, the WTIME utility provides a Use Daylight Savings Time check box.

The Modem Dial String control allows you to change the string your modem uses to dial the ACTS. WTIME allows a dial string of up to 79 characters. The default string

```
ATDT13034944774
```

should work for most Hayes-compatible

■ Utilities by Modem

The *PC Magazine* utilities are available by modem from PC MagNet, a ZiffNet service hosted by CompuServe.

To find the phone number nearest you, set your communications software to 300, 1,200, 2,400, or 9,600 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex, then dial 800-346-3247 with your modem. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you. Or you can call 800-635-6225 (voice) and follow the instructions and note the number.

To obtain the current issue's utility free of charge: Dial the local number; at the HOST NAME prompt, type CIS, and at the USER ID prompt, enter 60116.1. Then at the PASSWORD prompt, enter PCMAG-UTIL.

To join ZiffNet: At the USER ID prompt, type 177000,5000. Then, at the PASSWORD prompt, enter PC* MAGNET. Finally, at the ENTER AGREEMENT NUMBER prompt, type PCMAG92.

modems when you don't need to go through a PBX. The AT signals the modem that a command is about to follow. The DT specifies Touch-tone dialing, and 13034944774 is the phone number of the atomic clock you want to reach (303-494-4774). You can insert the hyphens in the actual dial string if you wish; the modem will ignore them.

You can change the dial string. For older, pulse-dialing systems, you'll need to change the DT to DP, for example. To dial 9 and pause for 2 seconds before actually dialing the phone number, change the dial string to

```
ATDT9,,13034944774
```

You might also want to add an M (for Mute) before the DT, to produce silent operation. Thus your dial string might look like this:

```
ATMDT13034944774
```

Register your name and enter your American Express, MasterCard, or Visa number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.) Your personal user ID and a temporary password will be displayed. A new password will arrive in the mail within ten days to confirm your subscription.

ZiffNet membership costs \$2.50 per month. This includes access to *PC Magazine* Editors' Choice Awards, Product Reviews index, Weekly News from *PC Week*, Buyers' Market, ZiffNet Highlights, and the Support Forum (which also includes the current utility). CompuServe members can join by entering GO PCMAG at any CompuServe ! prompt.

Outside of these areas, PC MagNet costs \$6.30 per hour for 300-bps service, \$12.80 for 1,200 or 2,400 bps, and \$22.80 for 9,600 bps. Billing is based on 1-minute increments.

These programs can be copied but are copyrighted. You may make copies for others as long as no charge is involved, but making copies for any commercial purpose is prohibited. □

One beta-tester even charged WTIME calls to his credit card. This involved several long sequences of digits separated by series of commas. If you do this, however, don't forget that anyone looking at your WIN.INI will see your phone credit card number!

The strings shown above will work for most modems. You may need to check your modem's manual for the proper dialing sequence if the default and modified strings don't work for you.

The last item you need to configure is the COM port. You may choose COM1, COM2, COM3, or COM4 as the port to which your modem is attached. The modem itself must be capable of operating at 1,200 bits per second (the fastest speed the ACTS currently supports), and Windows must be configured correctly to handle the port. If the TERMINAL program that comes with Windows works on your system, WTIME should handle your modem without a problem.

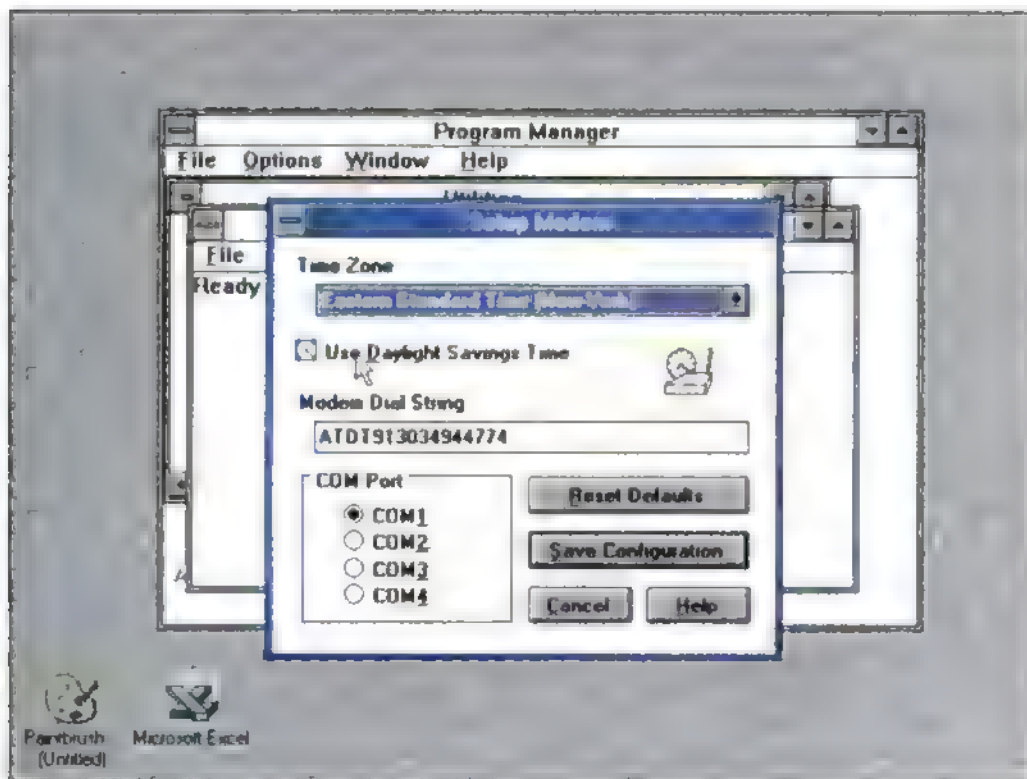


Figure 1: WTIME's Modem Setup dialog box is where you choose your time zone, daylight saving time preference, dial string, and COM port.

At any time, you can choose Reset Defaults, Save Configuration, or Cancel. Reset Defaults restores the original modem dial string, sets the time zone to Eastern, turns on the Daylight Savings Time option, and sets the COM port to COM1. Save Configuration writes your selected values to WIN.INI, and Cancel closes the Setup Modem dialog box without affecting your existing setup.

HOW WTIME WORKS The principal areas of interest in WTIME's code are the mechanisms it uses to store and access the configuration information, control the modem, get the local time, and set the PC clock. If you're a Quick C for Windows programmer and the function and variable names seem familiar, it's because I used QuickCase:W to generate the first program files.

You can uninstall WTIME by using NOTEPAD or SYSEDIT to delete the [WTime] section from WIN.INI. Then you just delete WTIME.EXE and WTIME.HLP. You'll also want to delete WTIME's icon in the Program Manager if you've set it up there. This process has been documented in WTIME's on-line help, and it cleanly eliminates WTIME from your system.

The WriteProfileString() function stores the configuration quite adequately, though I confess that a WriteProfileInt() function would have been a welcome addition. This would have been a natural partner to GetProfileInt() and would have saved having to implement the sprintf(), WriteProfileString() logic.

WTIME uses a call to GetProfileString() to retrieve the configuration information. I originally tried using GetProfileInt() to get the integer values, but this created a problem because OS/2's implementation of GetProfileInt() differs from that of Windows 3.x. In Windows 3.0 and 3.1, GetProfileInt() can return a negative value, but OS/2's version of Windows returns 0 for negative values. Since TimeOffset is a negative value for the entire western hemisphere, I had to make WTIME get integer values using MyGetProfileInt().

WTIME validates the configuration entries as they are read from WIN.INI. This obviates the need to test for odd conditions throughout the program. The validation takes place in iGetConfigurationInformation().

While programming the configuration

WTIME.C

1 of 3

```
LONG FAR PASCAL WndProc(HWND hWnd, WORD Message,
                        WORD wParam, LONG lParam) {
    HMENU hMenu=0;
    HBITMAP hBitmap=0;
    HDC hDC;
    PAINTSTRUCT ps;
    int nRc=0;
    switch(Message) {
    case WM_COMMAND:
        switch(wParam) {
            case IDM_CMD_FIRST_ESCAPE:
                UpdateStatusLineText("Sending "
                    "escape sequence");
                if(WriteComm(dcb.Id, "+++ ", 3) != 3) {
                    FailCall("Could not get "
                        "modem's attention");
                    break;
                }
                WaitSecondsCommand(TIMER_AT_CMD,
                    IDM_CMD_AT_CMD);
                break;
            case IDM_CMD_AT_CMD:
                if(!InCall) break;
                UpdateStatusLineText("Resetting modem");
                if(WriteComm(dcb.Id, "ATZ\r", 5) != 5) {
                    FailCall("Could not initialize modem");
                    break;
                }
                WaitSecondsCommand(TIMER_FIRST_RESET,
                    IDM_CMD_DIALTIME);
                break;
            case IDM_CMD_DIALTIME:
                if(!InCall) break;
                UpdateStatusLineText("Dialing modem");
                iMustHangUp=1;
                sprintf(szString, "%s\r",
                    (LPSTR) szModemDialString);
                if(WriteComm(dcb.Id, szString, strlen(szString))
                    != (int) strlen(szString)) {
                    FailCall("Could not dial");
                    break;
                }
        }
    }
}
```

```
WaitSecondsCommand(TIMER_DIAL,
    IDM_CMD_WAITDATA);
break;
case IDM_CMD_WAITDATA:
    if(!InCall) break;
    {
        static int gotspecials=0;
        static char newbuf[101];
        int read_chars, got_firstspecial, need_chars;
        NISTDATA *nist;
        LPSTR failstring=NULL;
        /* on first call, chg to call ea. second */
        if(wTimedTargetCmdToPost==
            IDM_CMD_WAITDATA) {
            wEachSecondCmdToPost=IDM_CMD_WAITDATA;
            iTargetTime=TIMER_TARGET_INACTIVE;
            wTimedTargetCmdToPost=TIMER_NEVER_POST;
            gotspecials=0;
            p=newbuf;
            UpdateStatusLineText("Looking for "
                "data");
        }
        /*
        ** now gather the data
        ** first, read 98 chars at a time
        ** we won't do anything until we find
        ** '*' or '@' three separate times
        ** then we'll show a string
        */
        GetDisplayCommError(dcb.Id, &comstat);
        read_chars=ReadComm(dcb.Id,
            p, 100-(p-newbuf));
        if(read_chars<8) read_chars=-1;
        if(gotspecials<3) {
            while(read_chars-->0) {
                if(*p=='*' || *p=='@') gotspecials++;
                p++;
            }
            p=newbuf;
            break;
        }
        /* ok we want to proceed, clean start */
    }
}
```



Figure 2: This section of WTIME.C shows the main sections of WTIME's modem-handling code.

WTIME.C

2 of 3

```

FlushComm(dcb.Id,1); /* rx queue */
p=newbuf;
got_firstspecial=0;
for(;;){
    p=newbuf;
    GetDisplayCommError(dcb.Id,&comstat);
    read_chars=ReadComm(dcb.Id,
        newbuf,100-sizeof(NISTDATA));
    if(read_chars<0)read_chars=-1;
    while(read_chars--){
        if(*p==' '||*p=='\n'){
            got_firstspecial=1;
            nist=(NISTDATA *)p;
            break;
        }
    }
    if(got_firstspecial){if(!InCall)break;}
}
if(!InCall)break;
if(!got_firstspecial){ /* resync */
    p=newbuf;
    got_specials=0;
    need_chars=sizeof(NISTDATA)-read_chars;
    break;
}
/*
** Now nist and p point to same char --
** that char is a special char
** there is room for the whole NISTDATA
** structure there. We need need_chars
** chars still to fill struct -- now we'll
** loop until we have our actual data
** and we'll convert it then. then we'll
** break out to wait for next special
** char
*/
while(!InCall){
    GetDisplayCommError(dcb.Id,&comstat);
    read_chars=ReadComm(dcb.Id,p,
        need_chars);
    if(read_chars<0)read_chars=-1;
    p+=read_chars;
    if(p>=nist->junk3)break;
}
/*
** if all valid data post ASAP
*/
if(!InCall)break;
{
    struct tm time,*tm_ptr;
    time_t Time;
    struct _dosdate_t dosdate;
    struct _dostime_t dostime;
    if(!isdigit((int)nist->year[0])){
        !isdigit((int)nist->year[1])
        !isdigit((int)nist->month[0])
        !isdigit((int)nist->month[1])
        !isdigit((int)nist->day[0])
        !isdigit((int)nist->day[1])
        !isdigit((int)nist->hour[0])
        !isdigit((int)nist->hour[1])
        !isdigit((int)nist->minute[0])
        !isdigit((int)nist->minute[1])
        !isdigit((int)nist->second[0])
        !isdigit((int)nist->second[1]){
            /* got invalid data so retry */
            got_specials=0;
            p=newbuf;
            break;
        }
    }
    time.tm_year=
        (((int)nist->year[0]-'0')*10)+
        ((int)nist->year[1]-'0');
    if(time.tm_year<90)time.tm_year+=100;
    time.tm_mon=
        (((int)nist->month[0]-'0')*10)+
        ((int)nist->month[1]-'0')-1;
    time.tm_mday=
        (((int)nist->day[0]-'0')*10)+
        ((int)nist->day[1]-'0');
    time.tm_hour=
        (((int)nist->hour[0]-'0')*10)+
        ((int)nist->hour[1]-'0');
    time.tm_min=
        (((int)nist->minute[0]-'0')*10)+
        ((int)nist->minute[1]-'0');
    time.tm_sec=
        (((int)nist->second[0]-'0')*10)+
        ((int)nist->second[1]-'0');
    time.tm_isdst=-1;
    daylight=0;
    timezone=0L;
    if((Time=mktime(&time))==-1L){
        failstring="Time conversion error";
        break;
    }
    timezone=-60L*(long)iTimeOffset;
    daylight=iUseDaylightSavings? 0:0;
}

```

```

if(!((tm_ptr=localtime(&Time)))||
    failstring="Local time error";
    break;
)
dosdate.day=
(unsigned char)tm_ptr->tm_mday;
dosdate.month=
(unsigned char)(1+tm_ptr->tm_mon);
dosdate.year=
(unsigned int)1900+tm_ptr->tm_year;
dostime.hour=
(unsigned char)tm_ptr->tm_hour;
dostime.minute=
(unsigned char)tm_ptr->tm_min;
dostime.second=
(unsigned char)tm_ptr->tm_sec;
if(_dos_settime(&dostime)){
    failstring="Couldn't set DOS time";
    break;
}
if(_dos_setdate(&dosdate)){
    failstring="Couldn't set DOS date";
    break;
}
UpdateStatusLineText("Time set");
}
/*
** clean up
** use failstring to drive failure
*/
wEachSecondCmdToPost=TIMER_NEVER_POST;
iTargetTime=TIMER_TARGET_INACTIVE;
wTimedTargetCmdToPost=TIMER_NEVER_POST;
if(failstring)FailCall(failstring);
else{
    iInCall=0;
    iThisRunFailed=0;
    PostMessage(hwnd,WM_COMMAND,
        IDM_CMD_CALLDONE,0L);
}
break;
case IDM_CMD_CALLDONE:
    iCleaningUp=1;
    iTargetTime=TIMER_TARGET_INACTIVE;
    wEachSecondCmdToPost=wTimedTargetCmdToPost=
        TIMER_NEVER_POST;
    if(!GotComPort&&iMustHangUp){
        UpdateStatusLineText(iThisRunFailed?
            "Abort: waiting to send escape sequence":
            "Success: waiting to send escape "
            "sequence");
        iTimerCount=1000;
        WaitSecondsCommand(TIMER_PREBREAK,
            IDM_CMD_PREBREAK);
        break;
    }
    else goto break_is_done;
case IDM_CMD_PREBREAK:
    GetDisplayCommError(dcb.Id,&comstat);
    WriteComm(dcb.Id,"+++ ",3);
    UpdateStatusLineText(iThisRunFailed?
        "Abort: sending escape sequence":
        "Success: sending escape sequence");
    WaitSecondsCommand(TIMER_POSTBREAK,
        IDM_CMD_POSTBREAK);
    break;
case IDM_CMD_POSTBREAK:
    UpdateStatusLineText(iThisRunFailed?
        "Abort: sending hang-up sequence":
        "Success: sending hang-up sequence");
    WriteComm(dcb.Id,"ATH0\n\r",6);
    /* fall through... */
case IDM_CMD_CALLQUIT:
    break_is_done:
    iCleaningUp=0;
    iTimerCount=0;
    iTargetTime=TIMER_TARGET_INACTIVE;
    wEachSecondCmdToPost=wTimedTargetCmdToPost=TIMER_NEVER_POST;
    close_comm_port();
    EnableMenuItem(hMainMenu,IDM_M_CALL,
        MF_ENABLED|MF_BYCOMMAND);
    EnableMenuItem(hMainMenu,IDM_M_SETUP,
        MF_ENABLED|MF_BYCOMMAND);
    EnableMenuItem(hMainMenu,IDM_M_HANGUP,
        MF_GRAYED|MF_BYCOMMAND);
    if(!iAutomatic)PostMessage(hwnd,WM_CLOSE,0,0L);
    if(!iAutomatic){
        if(!iThisRunFailed){
            MessageBox(hwnd,"Time and date\n"
                "successfully set","Call Complete",
                MB_ICONINFORMATION);
        }
        else{
            if(szFailString[0])MessageBox(hwnd,
                szFailString,"Time Set Aborted",
                MB_ICONSTOP);
            else MessageBox(hwnd,"Time and date\n"

```


WTIME.C

3 of 3

```

        "not set", "Call Complete", MB_ICONSTOP);
    }
    szCommError[0]=0;
    szDisplayString[0]=0;
    UpdateStatusLine();
    break;
default: return DefWindowProc(hWnd, Message,
    wParam, lParam);
}
break; /* End of WM_COMMAND */
LPSTR init_comm_port(void) {
    /*
    ** Sets up the COM port for access.
    ** Returns LPSTR to fail description,
    ** or NULL if success
    ** Uses the global variable DCB dcb.
    ** Also sets iGotComPort if success.
    */
    int rv;
    wprintf(szString, "COM%d", iComPort);
    rv=OpenComm(szString, 2048, 2048); /* tx rx buffs */
    dcb.Id=(BYTE)rv;
    if(rv<0) {
        LPSTR p;
        switch(rv) {
            case IE_BADID:
                p="Invalid or unsupported ID";
                break;
            case IE_BAUDRATE:
                p="Unsupported baud rate";
                break;
            case IE_BYTESIZE:
                p="Invalid byte size";
                break;
            case IE_DEFAULT:
                p="Error in default parameters";
                break;
            case IE_HARDWARE:
                p="Hardware not present";
                break;
            case IE_MEMORY:
                p="Unable to allocate queues";
                break;
            case IE_NOPEN:
                p="Device not open";
                break;
            case IE_OPEN:
                p="Device already open";
                break;
            default:
                p="Unknown communication error";
                break;
        }
    }
    else {
        return p;
    }
    else iGotComPort=1;
    dcb.BaudRate=1200;
    dcb.ByteSize=8;
    dcb.Parity=NOPARITY;
    dcb.StopBits=ONESTOPBIT;
    dcb.RtsTimeout=0;
    dcb.CtsTimeout=0;
    dcb.DsrTimeout=0;
    dcb.fBinary=1;
    dcb.fRtsDisable=0;
    dcb.fParity=0;
    dcb.fOutxCtsFlow=0;
    dcb.fOutxDsrFlow=0;
    dcb.fDummy=0;
    dcb.fDtrDisable=0;
    dcb.fOutX=0;
    dcb.fInX=0;
    dcb.fPeChar=0;
    dcb.fNull=1;
    dcb.fChEvt=1;
    dcb.fDtrFlow=0;
    dcb.fRtsFlow=0;
    dcb.fDummy2=0;
    dcb.XonChar=0;
    dcb.XoffChar=0;
    dcb.XonLim=10;
    dcb.XoffLim=10;
    dcb.PeChar=0;
    dcb.EofChar=0;
    dcb.EvtChar='>'; /* end of line, start of data */
    dcb.TxDelay=0;
    if(SetCommState(&dcb)) return "SetCommState() fail";
    GetCommEventMask(dcb.Id, EV_ERR|EV_RXCHAR|EV_RXFLAG|
    EV_TXEMPTY);
    GetDisplayCommError(dcb.Id, NULL);
    FlushComm(dcb.Id, 0); /* stop transmitting */
    FlushComm(dcb.Id, 1); /* stop receiving */
    return NULL;
}
void close_comm_port(void) {
    /*
    ** Releases the COM port allocated into dcb.
    ** Does nothing unless iGotComPort is nonzero.
    */
    if(!iGotComPort) return;
    EscapeCommFunction(dcb.Id, RESETDEV);
    FlushComm(dcb.Id, 0); /* stop transmitting */
    CloseComm(dcb.Id); /* release port, buffers */
    iGotComPort=0;
}

```

sections was very straightforward, programming the modem presented a few complications. Some of these arose from the fact that although the calling syntax is covered in the Windows 3.0 and 3.1 SDK manuals, Microsoft provides little documentation on how to use the communication functions. If you search the sample code that comes with the SDK and dig through Microsoft's Knowledge-Base, all you'll come up with are a few examples of working code. There's no complete discussion of how to conduct Windows serial communication. It thus required a lot of trial-and-error work before I could make WTIME's operation dependable for a wide range of hardware.

The primary functions needed are OpenComm(), ReadComm(), WriteComm(), and CloseComm(). You'll find most of my modem-handling code in Figure 2, which gives the listings for init_comm_port() and close_comm_port(), and for the WM_COMMAND

handling for WndProc().

Windows 3.0's serial communications don't follow the usual Windows model. Most of Windows is event-driven. Each significant event generates a message, which is sent to the program via the message loop. In WTIME, however, instead of getting received characters in messages from the communications driver, the program must constantly go out and poll the hardware, asking whether data is available.

Actually, the Windows 3.1 communications driver *can* send received data to applications by way of messages. But since the WTIME utility was designed to run under Version 3.0 as well, I couldn't make use of this facility. Therefore, WTIME must repeatedly poll the serial port to check data availability. Since I didn't want the program to dominate the system for the whole duration of the call, however, I decided to check the port only once per second.

The ACTS sends one line of data each second. To allow the line to settle and to allow WTIME to catch up with the data being transmitted, WTIME waits for three lines to be received before attempting to set the time. During this phase, WTIME is running for only a short time each second, in response to its 1-second timer. WTIME simply polls the port until three of the line-ending characters (* or #) go by.

At the start of the fourth line, WTIME repeatedly polls the serial port, grabbing each character as it becomes available. By the time the fourth line-ending character arrives, WTIME is ready to set the clock. This is good timing because the line-ending character arrives exactly on time, like the beep at the top of the hour beginning a newscast.

Converting GMT to local time looked as though it would be a difficult job at first glance. However, I found that the ANSI standard functions mktime() and

localtime() work together to perform the conversion.

I first fill *struct tm*—an ANSI standard structure—with the Greenwich mean time date and time information that comes from the ACTS. This information is converted to a *time_t* value (an ANSI standard data type that holds the number of seconds that have elapsed since an arbitrary date and time) with *mktime*. *WTIME* then uses *localtime()*—still another ANSI standard function—to put the current local time into a usable form, with daylight saving time and other factors taken into consideration.

Setting the PC clock is now an easy task. Both Borland and Microsoft provide *_dos_settime()* and *_dos_setdate()* functions. These functions use DOS services to set the DOS date and time. DOS versions since 3.1 have also maintained the CMOS (battery-backed) clock when the DOS time is set. The DOS time/date set function even works and goes right to the CMOS clock under OS/2.

CAVEATS I did run into a few anomalies while writing *WTIME*. The first had

to do with compiling Windows help files. When I used WinWord 2.0 to generate the .RTF help source file, the help compiler could not produce a working .HLP file. I had to get a later version of HC.EXE from the Microsoft Software Library.

I also encountered problems with Borland's runtime library. The documentation for *localtime()* indicates that you can set the daylight and timezone variables prior to a call to *localtime()*. Actually, that is not correct, for *localtime()* calls *tzset()*, which resets both daylight and timezone. My solution was to provide a stub *tzset()*, which is compiled and linked only when the Borland compiler is used.

Although you could always set your PC's clock by your wristwatch, there's something very satisfying about knowing that your machine's reading is derived from the Time and Frequency Division of the National Institute of Standards and Technology (NIST), from which the ACTS gets its time information.

Indeed, it is possible to get more preci-

sion from the ACTS time signal than *WTIME* itself provides, for the ACTS can even correct for satellite-induced telephone line delays. You can get more details about NIST and the ACTS by writing to NIST-ACTS, Time and Frequency Division, Mail Stop 52, 325 Broadway, Boulder, CO 80303.

The ACTS maintains six telephone lines and allows a maximum connection of 1 minute per call. The telephone number is 303-494-4774, and the connection can occur at either 300 or 1,200 bits per second. Data bits should be set to 8, with no parity and 1 stop bit (8N1). For now, calls to the ACTS incur only a telephone toll charge. It is possible, however, that NIST will eventually be establishing a 900 number with a fixed charge per minute. As long as the data format does not change, *WTIME* should work fine with a different phone number once the appropriate changes are made to the modem dial string. □

JOHN DEURBROUCK IS A C AND 80x86 ASSEMBLY PROGRAMMER WHO WORKS ON PC PLATFORMS.

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LAB NOTES

Understanding the New Developments in Parallel Ports

BY DOUGLAS BOLING

Serial ports send data relatively slowly over long distances, while parallel ports provide rapid transmission across short distances. I discussed serial ports in the Lab Notes columns of May 12 and 26, 1992; now it's time to turn to the other common input/output (I/O) port. As before, I'll try to cover both the basics and new developments, in this case culminating in the Type 3 bi-directional printer port of IBM's PS/2 series and Intel's Fast Mode parallel port.

The beauty of a parallel port lies in the simplicity of its design. When the computer sends a byte of data to a parallel I/O port, eight data lines transmit the entire eight-bit byte at once. The I/O port matches the eight bits of the byte to eight different pins on a connector, and the external device attached to the connector can then read the data at its leisure. (In practice, an extra line is usually used to indicate that the data on the pins is valid.)

While normally used to send data to a printer, a parallel port can be connected to a variety of external devices. In the early days of computing, when most computers came as kits to be built by hobbyists, the parallel port was used to read a set of switches for input, flip relays to control machines, or blink little lights for the amusement of the curious. Most hobbyists' computers used a parallel port to scan the switch matrix that formed the keyboard for the system, and indeed the keyboards on most PCs to this day are read through a parallel port on the keyboard controller.

THE PC'S ORIGINAL PARALLEL PORTS
Like serial ports, most parallel ports on early computers were bidirectional: The data lines could both send and receive data. When IBM introduced the PC,

however, it was meant to be a small business computer; the neat uses to which hobbyists could put a parallel port were not a consideration. Businesses didn't need to flip relays or blink lights, but they did need to print documents. Thus, the generic parallel port was specialized to talk to the standard Centronics printer interface.

Improved parallel ports can do a lot more than drive printers by using new technology from IBM and Intel.

IBM offered two versions of parallel ports on the original PC. One version was attached to the Monochrome Display Adapter (MDA), which I'll call the MDA printer port; the other was located on the separate Parallel Printer Adapter.

The MDA printer port was the more popular, since it provided a printer connection without the need for an extra card. (The original PC motherboard had only five slots, remember.) The design of the parallel port on the MDA card and the parallel port on the Parallel Printer Adapter were almost identical, however, with their only difference being the starting addresses of the I/O registers used to control the port. The MDA printer-port registers started at I/O address 3BCh, and the printer adapter registers started at I/O address 378h.

The design of the PC Printer Port differed from that of a generic, hobbyists' parallel port in two main ways. The first

was in its adding a number of control lines to the eight data lines. Figure 1 shows the lines on the MDA printer port and their connector pin assignments. These control lines allowed the PC to control the printer while allowing the printer to return status information to the PC. The second major way the PC Printer Port differed from others was in its data lines, which were not bidirectional but for output only. The output-only nature of the port provided enough functionality to send data to a printer, but it limited the usefulness of the port for other tasks.

In other respects, the MDA parallel-printer port followed the usual conventions. The voltage levels on the pins (or lines) are the standard Transistor-Transistor Logic (TTL) voltage levels of 0 and 5 volts. A value of 0 is represented by a voltage of 0 to 0.8 volts, and a value of 1 is represented by a level of 2 to 5 volts. When a line is said to be *lowered* it is simply being changed from a 1 state to a 0 state. *Raising* a line means the line is being changed from a logic 0 state to a 1 state.

As shown in Figure 1, the Data Register lines in the MDA printer port are unidirectional: Data can be sent only from the computer to the printer. The control and status lines allow for a minimal handshaking protocol to transfer the data to the printer. Of the four control lines, the first three (SLCT IN, INIT, and AUTO LF XT) initialize and configure the printer. The SLCT IN line tells the printer that it should get ready to accept data. The INIT line initializes the printer, and the AUTO LF XT line tells the printer to move automatically to the next line when a line of text has been printed. The fourth, STROBE control line, tells the printer that a new data byte is ready

MDA Printer Port Connections

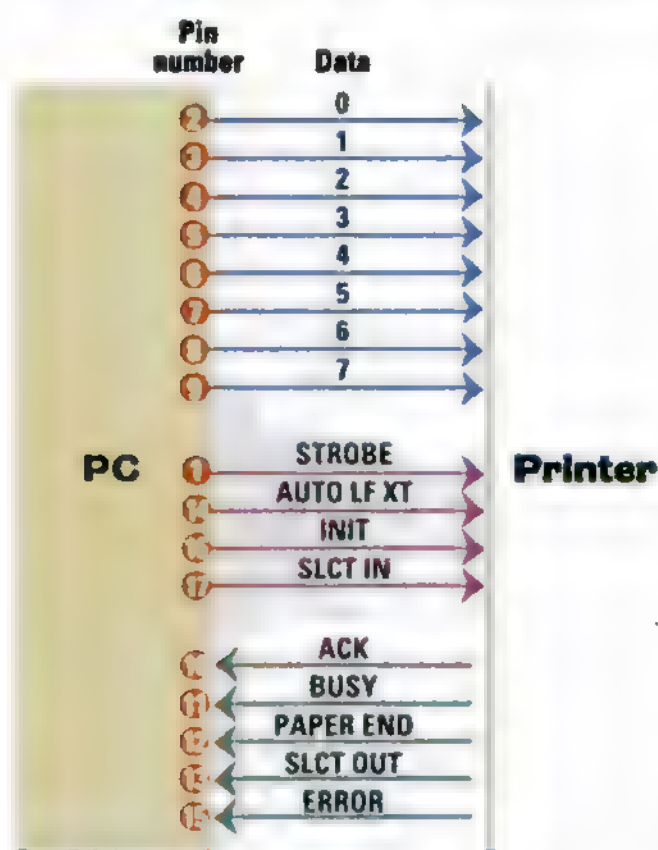


Figure 1: In addition to its 8 data lines, the standard PC printer port has 4 control lines going from the PC to the printer and 5 status lines from the printer to the PC.

to be read.

The five printer status lines return information to the PC. The SLCT OUT line indicates that the printer knows it has been selected. The BUSY line indicates that the printer is busy and cannot accept data. The PAPER END line indicates that the printer has run out of paper. The ERROR line indicates the printer has detected an error condition.

The fifth, ACK line, indicates that the printer has accepted the data from the computer and is ready to read another byte. This line is special, since the printer port can be configured to interrupt the processor with a request for more data when the ACK line is lowered.

As with such system peripherals as disk controllers and serial ports, the CPU controls the parallel port through I/O registers. Figure 2 details the three registers that make up the standard register-level interface for PC parallel ports. The printer data register sends data to the printer, the printer status register reads printer status, and the printer control register sets the printer control lines. The features that have been added in later revisions of the port structure are shown by shaded areas in Figure 2.

As with the registers for the serial port, the parallel-port registers are accessed through the IN and OUT I/O in-

structions. The starting address of the parallel-port registers are listed in the BIOS data segment, starting at 40:08. While the registers of the MDA printer port start at I/O address 3BCh and can't be changed, newer printer ports can be addressed at a variety of I/O addresses, typically starting at 378h and 278h.

Writing a byte to the parallel-port data register sends that byte to the port. When the data register is read, however, the byte returned is the data currently being sent by the printer port. This would seem to indicate that the MDA printer port is inherently bidirectional. The problem is, however, that there is no way to tell an MDA printer port to *stop* sending data. In other words, the printer port can't listen for any data coming from other devices connected to it simply because there is no way to tell it to stop talking! If another machine does attempt to send data across the data lines (something that should not be done with the MDA printer port), the data read would be a combination (logically ORed) of the data being sent by the MDA port and the data being sent to it.

The port status register, however, allows the processor to read the port status lines (SLCT, BUSY, PAPER END, ERROR, and ACK) from the printer. Writing to the printer status register has no effect. The status lines thus provide the port with a rudimentary input capability. This ability to read in data—albeit a nibble (four bits) at a time—is in fact utilized by many file-transfer programs.

For example, two MDA ports can be made to talk together if the pins are specially connected for this purpose. If the lower four data bits from one PC are connected to the SLCT, BUSY, PAPER END, and ERROR lines of a second PC, the one PC can send four bits of data out its MDA printer port. The other PC reads that data on its MDA printer status lines. To send data back, a similar connection is made in which the second PC's lower four parallel-port data lines are connected to the first PC's printer status lines. While the ACK line could be used as a fifth bit to read data in this arrangement, it is better employed allowing one PC to interrupt the other to indicate that the data has been or is ready to be read.

The printer control register allows the processor to manipulate the control lines

of the printer interface. Unlike in the serial interface, all the handshaking must be performed directly by the processor. As with the data register, the data written to the port control register is immediately passed to the output pins of the printer port. Note in Figure 2 that bit 4 of the port control register is not connected to a control line; it is used instead to enable the parallel-port interrupt. Once enabled, the parallel port will interrupt the processor when the ACK line is lowered. The parallel port is normally assigned hardware interrupt 7. Reading this register returns the state of the same control lines being sent to the printer.

Before concluding this discussion of the standard PC parallel port, it is important to clarify one confusing characteristic of the PC parallel port (and of all other digital hardware): the concept of a *negative active* signal. This is important if you ever attempt to relate the state of the bits in the parallel control and status registers with the voltage levels of their corresponding pins on the port connector.

Some of the control signals on the printer port are negative active. This means that the signals are considered present when the line carries a logical 0 instead of a 1 value. To compound the

Two MDA ports can be made to talk together if the pins are specially connected for this purpose.

confusion, some of the control lines in the parallel port are inverted before they reach the pins on the connectors. That is to say, writing a 1 value to a bit in the printer control register results in a logical 0 on the actual line. Some of the bits in the printer status register are also the inverse of the voltage levels on the pins.

Specifically, the lines that are inverted from the bits in the control register are STROBE, AUTO LF XT, and SLCT IN. BUSY is the only other line that is inverted from its corresponding bit. Other status register signals, namely ACK and ERROR, are negative active, but their corresponding register bits are *not* the inverse of their pins.

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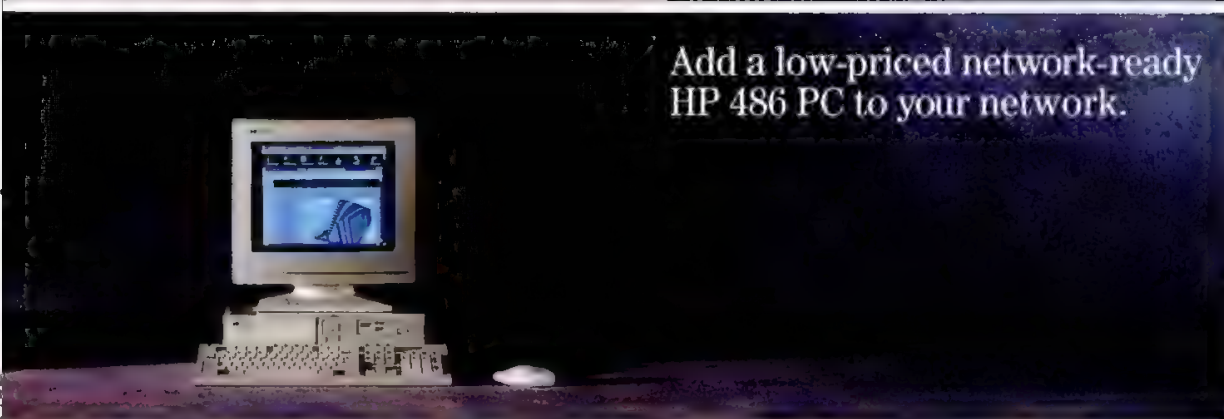


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PS/2 BIDIRECTIONAL PARALLEL PORTS

When IBM introduced the PS/2 series in 1987, the parallel port was rescued from its printer-only captivity. While retaining backward compatibility with the printer adapters of the earlier PCs, the parallel port on the PS/2 machines was re-designed to include the bidirectional capabilities of pre-PC parallel ports.

Restoring bidirectional capabilities simply required making it possible to turn off the data lines from the PC, thus allowing data from another source to be sent on those lines. With the PC no longer sending data, a read of the printer data register returned the data being sent from another device attached to the port.

To set the PS/2 parallel port to read mode, a previously reserved bit in the printer control register is used to establish the direction of the data. Specifically, setting bit 5 to 1 configures the parallel port for input. The port itself must be configured to allow bidirectional mode. On PS/2s the parallel port can be set up in bidirectional mode by using the configuration disk that is provided with the machine.

Other manufacturers have also introduced a bidirectional parallel port on their machines. The parallel ports in some machines that use the Chips & Technologies chip sets are compatible with the PS/2 parallel port, for example. Not all competing machines have followed the IBM PS/2 standard for controlling the direction of the port, however. The Toshiba machines use bit 7 of the port control register instead of bit 5, for example. As with the PS/2s, the parallel port in clone machines must be configured for bidirectional operation. This is usually done with a setup program specific to the system.

THE TYPE 3 PARALLEL PORT The bidirectional port on the original PS/2 was called a Type 1 parallel port. The new PS/2 Models 57, 90, and 95 have what IBM calls its Type 3 parallel port. (The IBM hardware reference also covers a Type 2 parallel-port controller, which is slightly less capable than the Type 3 controller.) The Type 3 port can use a DMA (direct memory access) channel to write or read an entire block of data to the port without assistance from the processor. The discussion below will center on the Type 3 controller, but the differences be-

tween the other two bidirectional controllers will be noted as appropriate.

From its introduction in 1981, the PC has had a DMA controller. The DMA controller is a chip that does nothing but move data around in memory. If the CPU needs to move a block of data, it can delegate the job to the DMA chip while it does more productive things. A DMA chip usually has a number of channels, each of which can move a block of memory or move data to and from an I/O port.

Like a DMA channel, the Type 3 parallel port can run independent of the CPU. In DMA mode, the DMA chip and the parallel port talk to each other without the help or interference of the CPU.

In DMA mode, the parallel port uses the STROBE, ACK, AUTO LF XT, and

BUSY lines to control data transfer between the PS/2 and an external device. The only tasks the CPU must perform are to set the parallel port into DMA mode and to configure a DMA channel to read or write data. Once configured, the DMA channel automatically reads a byte of data from memory and writes it to the data register of the parallel port.

Once data has been written to the data register by the DMA channel, the parallel port automatically lowers the STROBE signal. This indicates to any device attached to the port that the data lines are ready to be read. Once the receiving device has read the data, it in turn lowers the ACK line to indicate that fact. The Type 3 parallel port then automatically raises the STROBE line and signals

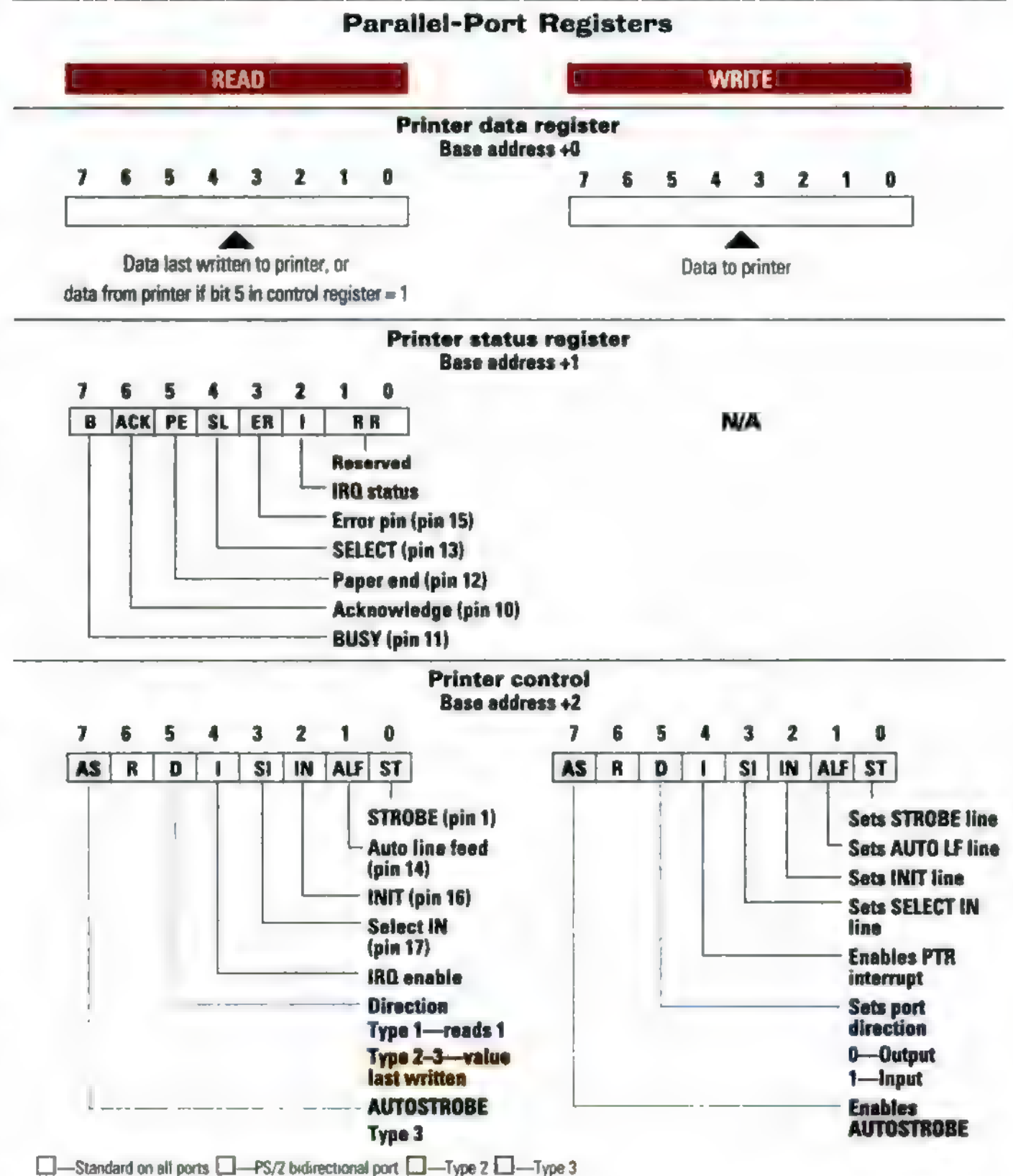
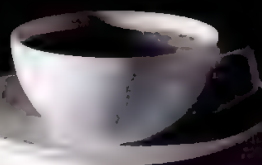


Figure 2: The printer data register, printer status register, and the printer control register comprise the original PC parallel-port interface. Shaded areas in the figure indicate additions made to this structure in newer PS/2 models.

Three things that please both you and your PC users.

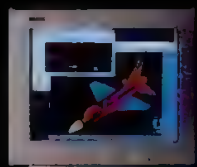
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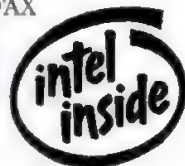
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the DMA channel to write another byte of data to the data register. The cycle is then ready to begin all over again, continuing until the DMA controller has sent the entire contents of its buffer. At any point the receiving device can suspend the data transfer by lowering the BUSY line.

When configured in receive DMA mode, the DMA controller waits until the ACK line changes from a 1 to a 0 state. The port controller detects this change, lowers the AUTO LF XT line, and then reads the byte from the data register. Thereafter the port controller raises the AUTO LF XT line and lowers the STROBE line to indicate that the data has been read. The Type 3 parallel port can be programmed to interrupt the CPU when the DMA operation is complete.

If two PS/2s are to transfer data using the DMA mode, their two parallel ports should be connected in the manner shown in Figure 3. This particular configuration allows the two parallel-port controllers to produce the proper handshaking for the DMA transfer. So connected, a pair of PS/2s using their DMA parallel ports can transfer data at up to 2MB per second, a transfer rate rivaling that of some hard disk controllers. And this speed is available with almost no work from the processor.

The DMA mode was not the only improvement made in the Type 3 port. The port also has expanded interrupt capabilities. The parallel-port controller can interrupt the processor on changes in the ERROR, PAPER END (PE), and SLCT. Like all previous parallel ports, the new port can also interrupt the pro-

PS/2 Type 2 and 3 Port Addresses					
Port	1	Alt 1*	2	3	4 (only type 3)
Printer data register	3BC	1278	378	278	1378
Printer status	3BD	1279	379	279	1379
Printer control	3BE	127A	37A	27A	137A
Interface control		127B	37B	27B	137B
Interface status		127C	37C	27C	137C
Reserved register		127D	37D	27E	137D

*Type 3 port alternate addresses when configured as parallel 1

Figure 4: In the chart above, note that a Type 2 PS/2 port configured for LPT1 cannot be set up for DMA mode.

cessor when the ACK line is lowered.

Three new registers were added to the parallel-port register set to control the enhanced Type 2 and Type 3 parallel ports. This presented a problem when the port was configured at the old standard starting I/O address of 3BCh, because if the new registers were placed at their logical location (just after the other port registers) they would overlap the registers that control the VGA palette. To solve this problem, the Type 3 parallel port can be addressed at two different I/O address ranges if configured as parallel port 1. When the parallel port is configured as LPT 2, 3, or 4, the dual addressing is not necessary.

The possible I/O address ranges for PS/2 Type 2 and 3 parallel ports are shown in Figure 4. The Type 2 parallel port cannot be set up for DMA mode when configured as parallel port 1. Parallel-port registers start at I/O addresses 378h, 278h, and 1378h for ports 2, 3, and 4, respectively. Note that while these addresses are valid for IBM PS/2 parallel ports, they are not necessarily those used on other machines. The Printer Port Base Address fields in the BIOS data area are the best place to determine the printer port addresses.

Figure 5 shows the three new registers for the PS/2 Type 2 and 3 parallel ports. The first of these is the read/write interface control register. This register enables and controls the DMA process, and it also selects the conditions for interrupting the processor. Writing a 1 to bit 7 (Start DMA) initiates a DMA transfer. Setting bit 6 (Reset End of Data Latch) enables the DMA channel to read from the parallel port in response to the ACK line. Bit 1 (Set End of Data Latch) stops a DMA transfer. Finally, bit 0 (Enable DMA) enables the DMA function. Only

the limited combination of the bit settings shown below are valid for these bits.

Bits	Description
7 6 1 0	
0 0 0 1	No change to DMA operation
0 0 1 0	Disable DMA
0 0 1 1	Halt DMA or enable DMA
0 1 0 1	Set ready to start DMA in receive mode
1 0 0 1	Start DMA in send mode

The remaining bits in the interface control register enable the different interrupt conditions for the port. Bit 5 enables an interrupt when the DMA controller completes its transfer or when the End of Data Latch is set and a change in the ACK line is detected. Bit 4 enables an interrupt when the SLCT signal is changed, either from a 0 to a 1 or from a 1 to a 0. Bits 3 and 2 enable interrupts from the ERROR and Paper End (PE) lines, respectively.

The Interface Status register allows the processor to determine the source of a parallel-port interrupt and determines the status of a DMA transfer. Bit 6 indicates if a DMA transfer is complete or if it has been stopped using the End-of-Data bit in the interface control register. Bits 5 through 2 indicate the source of an interrupt caused by the parallel port. Bits 7, 1, and 0 are reserved.

The last of the new registers is officially reserved by IBM, except that it must be loaded with a value of 16h before using the DMA mode of the port.

THE 386SL HIGH-SPEED PARALLEL PORT
Intel has taken a different approach to the design of a high-performance parallel port. The company's new 386SL chip set is a low-power, two-chip package that integrates a 386SX processor with the logic

DMA Mode PS/2 Connections

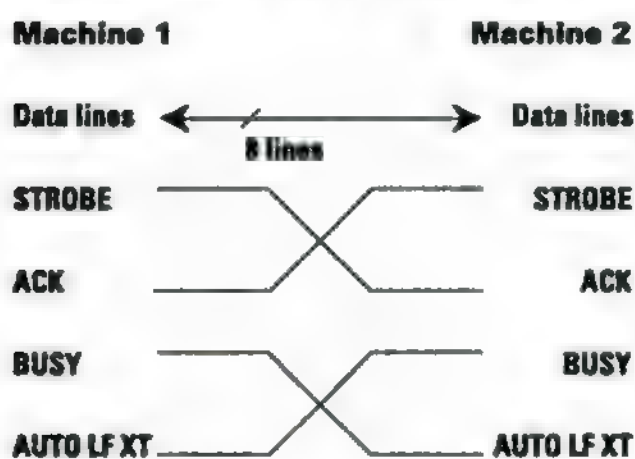


Figure 3: When a pair of PS/2 machines using Type 3 ports are connected as above, the data transfer rate can reach 2 megabytes per second.

Type 3 Parallel-Port Registers

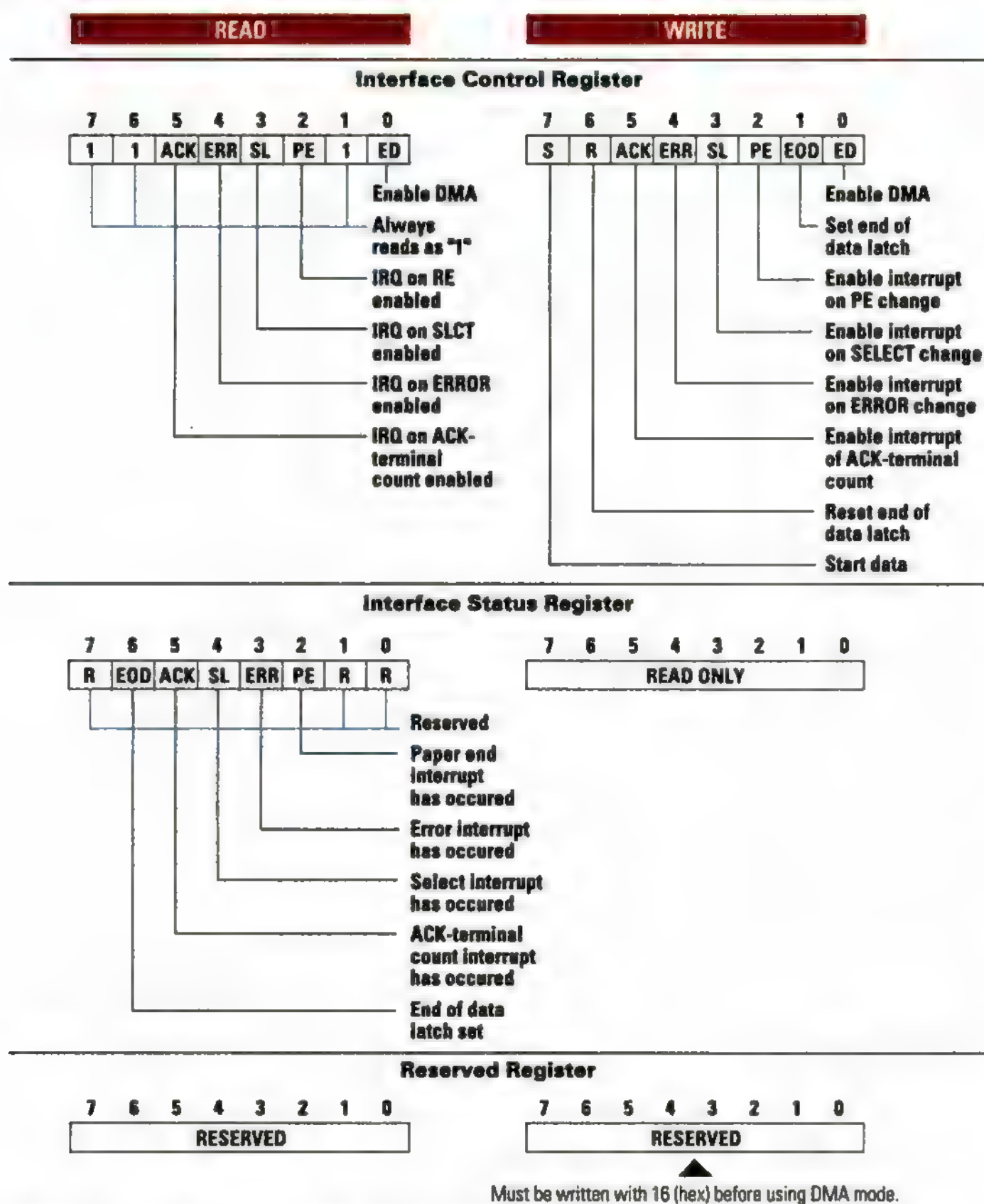


Figure 6: The IBM PS/2 Type 3 parallel port incorporates three new registers.

needed for a laptop computer. Included in the 386SL is what Intel calls its Fast Mode parallel port.

IBM's Type 3 parallel port is designed to move large chunks of data very fast without assistance from the processor. This type of parallel port is best suited to multitasking environments in which the processor has better things to do than sit feeding data to a slow printer. In contrast to IBM's DMA parallel port, the Intel design is aimed at speeding the access to intelligent peripherals attached to the parallel port.

With the growth of laptops in offices, an entire industry has been built around peripherals that attach to laptops without requiring an expansion slot. While exter-

nal modems have been around for years, the most interesting slotless peripherals are the new LAN adapters that attach to—and make new demands on—the parallel port of a laptop.

Both the parallel port and intelligent adapters are controlled by registers. While printing a document is largely a matter of pushing massive amounts of data out the parallel port, communicating with an intelligent LAN adapter involves control as precise as if the LAN adapter were a card plugged into the expansion bus. The problem is that with only eight bits of data being transferred at a time, any access to an intelligent adapter register must be preceded by an address that specifies the register to be

read or written. Further, since the port must be used for both address and data transfer, the control lines must be used to tell the peripheral both what is coming across the port and how to react to it.

Suppose that the processor needs to write to the LAN adapter. It must start with a write to the printer control register to set the handshaking bits indicating that an address is coming and that the access will be a read of a register in the adapter. The address is then written to the printer data port. The LAN adapter takes the address, places the data on the parallel port, and sets a control line (such as ACK or BUSY) to indicate that the data is available. The processor then reads the status port to find out that the LAN adapter has the register data available. Only at this point can the data be read from the parallel port. All of this elaborate handshaking takes time, and for peripherals such as LAN adapters, speed is important. To streamline the process, then, the Intel Fast parallel port automatically encodes the handshaking information on the control lines.

As you can see in Figure 6, when operating in Fast Mode, the Intel port redefines the standard parallel-port control lines so that they become bus control lines. The SLCT IN line becomes the Address Strobe, AUTO LFX T becomes the Data Strobe, STROBE becomes the Write line, the BUSY line becomes the Wait line, and the ACK line becomes the Interrupt Request line. This allows a full complement of control lines to make the parallel port into a mini-expansion port.

The Intel port uses different I/O addresses to encode the control information. While the Intel port has the standard data, control, and status registers of any parallel port, its Fast Mode also has five additional I/O addresses, which are located just above the standard addresses. If the parallel-port base address is 3F8h, the I/O addresses 3F8, 3F9, and 3FA are the addresses of the printer data, printer status, and printer control registers as expected. What is different about the 386SL printer port is the use of the I/O addresses immediately above the three standard I/O addresses.

I/O address 3FBh is the automatic address of the strobe register. A write to this register sends the data to the parallel

port, just as writing to the data register would. In addition, however, a write to the strobe register automatically lowers the AUTO LF XT line, which is defined as the Address Strobe line. A read or write to addresses 3FCh through 3FFh reads or writes the port and also lowers the Data Strobe line (SLCT IN). If the data access to addresses 3FCh through 3FFh is a write, the Write line (STROBE) is lowered. When the processor writes to the automatic Data Strobe addresses, the read or write I/O cycle is extended if the adapter lowers the Wait (BUSY) line. This allows the adapter to slow the processor to match its speed without the processor even knowing about the wait.

A peripheral attached to the 386SL's parallel port simply looks at the control lines to determine what is coming across them. If the Address Strobe line (AUTO LF XT) is low, an address is being sent to the peripheral. If at the same time, the Write (STROBE) line is high, the 386SL is expecting the peripheral to return the data for that address back to the SL.

Intel 386SL Fast-Mode Configuration			
PIN		STANDARD MODE	*FAST MODE
1	Output	STROBE	WRITE
10	Input	ACK	INTR
11	Input	BUSY	WAIT
14	Output	AUTO LF XT	Data STROBE
17	Output	SLCT IN	Address STROBE
*FAST MODE		DESCRIPTION OF LINES IN FAST MODE	
WRITE		Indicates a write cycle to the adapter when low.	
INTR		Pulled low by the adapter to interrupt the processor.	
WAIT		Held low by the adapter to extend an I/O cycle to the port.	
Data STROBE		When low, indicates that data is being transferred on the data lines.	
Address STROBE		When low, indicates that an address is being transferred on the data line.	

Figure 6: Laptops using the Intel 386SL chip set streamline the handshaking protocol process by redefining the parallel-port control lines.

Otherwise, the SL sends the data to be written to the address. At any time, the peripheral can slow down the process by holding down the Wait (BUSY) line. The SL will wait until the Wait line is high before ending the current read or write.

This automatic encoding saves a tremendous amount of needless handshaking through the control lines. By eliminating the need to set the control lines manually, accesses to registers on the adapters can be made in half the time.

Like its serial cousin, the parallel port has grown significantly in functionality. IBM's DMA parallel port and Intel's Fast Mode parallel port represent two different enhancements aimed at two different applications. These new parallel-port designs will contribute tangibly to better computing performance in the future. □

DOUGLAS BOLING IS A CONTRIBUTING EDITOR TO PC MAGAZINE.

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Exploring the Structure Of MIDI Files

BY CHARLES PETZOLD

The MIDI (Musical Instrument Digital Interface) file format is just about the only industry standard that has yet emerged in the world of multimedia. Basically, a MIDI file stores all the MIDI messages and timing information needed to reproduce a musical composition on an electronic music synthesizer. The file format began in the Macintosh and Amiga environments and is now supported under Windows 3.1.

Windows 3.1 supports the MIDI file format in a very straightforward way: If you have a MIDI board and a Windows driver in your system, you can play MIDI files using several high-level MCI (Media Control Interface) commands. It isn't necessary to know the MIDI file format when using MCI, but it helps. In particular, timing and tempo are based on the characteristics of the file. You definitely do need to know the MIDI file format if you want to create MIDI files from one of your own programs. MCI does not support recording MIDI sequences to a file.

The MIDI file format is described in a 14-page document, "Standard MIDI Files 1.0," which may be obtained from the International MIDI Association for \$7 plus \$1.50 postage and handling. (Call 310-649-6434 for details. The IMA is also the primary source for other MIDI documentation.) For a quick low-cost preview, you can download a preliminary draft of this document from the MIDI-FORUM on CompuServe. The file is called MFF.TXT and is in Library 3.

BYTE-ORDERING CONFUSION In comparison with machines such as the Macintosh and the Amiga, PC compatibles are relative latecomers to multimedia and music. Because the Apple Macintosh

and Amiga are based on Motorola microprocessors rather than Intel microprocessors, a problem occurs when creating files that can be interchanged with PC compatibles. As you know, Intel microprocessors store multibyte values in memory beginning with the least significant byte. (This is sometimes called a *little endian* architecture.) Motorola microprocessors, on the other hand, use a *big endian* archi-

as 00 01 86 A0 in MIDI files. Of course, the Motorola byte ordering is a little easier to read in file dumps.

With this in mind, let's begin looking at a dump of a small MIDI file. By convention, MIDI files on the PC have a .MID extension. We'll take a look at a sample file that plays the two-bar fragment of music shown in Figure 1. In this instance, the music is intended for a church organ.

For a MIDI file designed for Windows 3.1, a musical composition should be encoded in the file twice to accommodate the two types of synthesizers supported under Windows' Multimedia Extensions. Extended synthesizers use MIDI channels 0 through 10 (10 is the percussion channel), and base-level synthesizers use channels 12 through 15 (15 for percussion). Accordingly, our sample file plays the fragment on channels 0 and 12. Figure 2 shows a hexadecimal dump of this file.

CHUNKS AND TRACKS MIDI files are organized in chunks of data, each of which begins with a four-character identifier followed by a 4-byte chunk-data size. MIDI files contain only two types of chunks—header chunks and track chunks. They always begin with a header chunk, which is followed by one or more track chunks that contain the actual MIDI data.

Whether a file has one track or multiple tracks depends on the type of the file. A type 0 MIDI file has one track; a type 1 MIDI file can have multiple tracks intended to be played simultaneously. (Type 2 MIDI files—which are not supported by MCI as implemented in Windows 3.1—can contain multiple independent tracks.)

Compositions are separated into tracks mostly to facilitate programs that

*Using a tiny musical
fragment and its
associated MIDI
file, let's examine
the standard MIDI
file format.*

itecture, which stores the most significant byte first. Because it's most convenient to write files from blocks of memory, this byte ordering can also carry over into file formats.

Some personal computer file formats—perhaps most notably the Tagged Image File Format (TIFF) used for storing bitmapped images—can be encoded using either method of byte ordering. Of course, PC programs that read TIFF files must be prepared to swap bytes around in memory when reading a file that originated on a Mac. But the MIDI file format uses Motorola byte ordering only. Thus, if you're accustomed to looking at file dumps and seeing (for example) a 4-byte value of the hexadecimal number 186A0 (100,000 decimal) stored as A0 86 01 00, you'll have to get used to seeing it stored

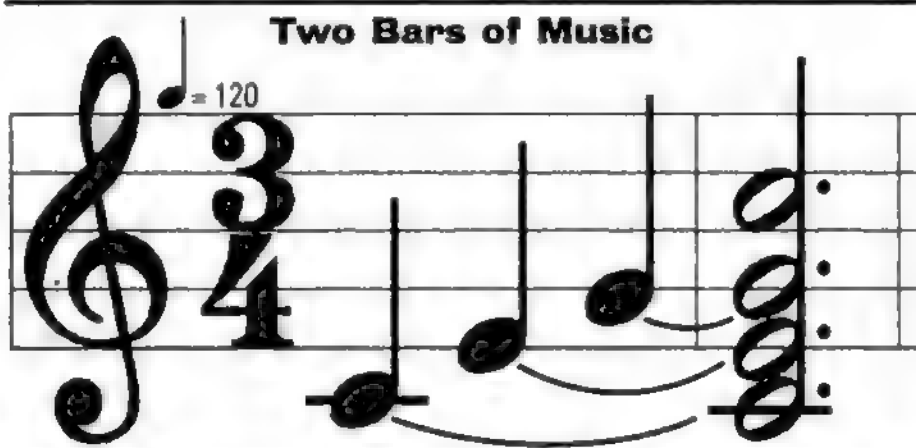


Figure 1: A musical fragment used to illustrate the MIDI file format

let you create and edit MIDI files based on a tape recorder metaphor. For MIDI files designed for Windows 3.1, one track can contain the composition for an extended synthesizer while another contains a version for a base-level synthesizer. A type 1 file can always be converted into a type 0 file. Note that in type 1 files all tempo information must be in the first track.

The header chunk begins with the four-character identifier MThd, and the data size is always 6 bytes. Thus, the total size of the chunk is 14 bytes. In the file shown in Figure 2, the header chunk data consists of the bytes 00 01 00 03 00 F0. The first 2-byte word indicates the file type (0, 1, or 2). The second 2-byte word is the number of tracks; this value will always be 1 for a type 0 file. In the sample file, the first track contains the tempo information; the second track contains the music for an extended synthesizer, and the third track contains the base-level version.

The third 2-byte word is the division value, which I discussed in the past two columns. In this sample file, a quarter note is divided in 240 (0xF0) parts. All timing information in the file is based on this quarter-note division.

In a SMPTE file, the high byte of this word contains the negative of the SMPTE time code type (such as -24 or 0xE8 for 24 frames per second). Note that -29 indicates the 30 drop frame format. The low byte indicates the division of a frame.

The track chunks begin with a chunk identifier of MTrk followed by the 32-bit track length, followed by track events. In the file shown in Figure 2, the three track chunks begin at offsets 0x0E, 0x29, and 0x59. Each track event actually consists of a delta time followed by an event. An event can be a MIDI short message, a

MIDI long (system-exclusive) message, or a meta-event. When a file is played, the delta times indicate the delays between the events.

VARIABLE-LENGTH DELTA TIMES To keep the size of the MIDI file as small as possible, delta times are stored as variable-length quantities. The delta times

can be 1, 2, 3, or 4 bytes long, with seven bits of data in each byte. The high bit of each byte is set to 1 except in the last byte. This can be a little confusing the first time you encounter it. Delta times of 0 through 127 are specified in the file by single bytes ranging from 0x00 through 0x7F. A delta time of 128 requires 2 bytes: 0x81 and 0x00. The high bit of the first byte is set to 1, indicating that it's not the last byte. The low bit of the first byte is combined with the bottom seven bits of the second byte to create 0x80.

Let's look at some examples using a technique that's handy if you're converting by hand. Suppose you want to represent the number 240, which is 0xF0. First, write the individual bits:

1110000

Then separate the expression into seven-bit values:

0000001 1110000

Put a 1 bit on top of the first and a 0 bit on top of the next:

10000001 01110000

Thus, 240 is represented as the delta time 81 70.

Now suppose you encounter the delta time 86 8D 20. Write down the bits:

10000110 10001101 00100000

Remove the top bits:

0000110 0001101 0100000

Group them in eight-bit values beginning at the right:

00000001 10000110 10100000

Now back to bytes: 01 86 A0. That's the value 0x0186A0, or 100,000 in decimal.

META-EVENTS As I indicated, a track is composed of track events. Each track event is a delta time followed by a MIDI short message, a system-exclusive message, or a meta-event. The MIDI short messages and system-exclusive messages are sent directly to the music synthesizer. Meta-events are instructions and other

To keep the size of the MIDI file as small as possible, delta times are stored as variable-length quantities.

information for the software playing the MIDI file.

Meta-events always begin with a byte of 0xFF. The second byte indicates the type of meta-event. The third is the length of data associated with the meta-event, and may be followed by 0 or more bytes of meta-event data.

In the example in Figure 2, the first track is 19 (0x13) bytes long and contains three events. Each event consists of a delta time of 0 (meaning that the events are to occur without pause), followed by a meta-event.

The first meta-event is

FF 58 04 03 02 18 08

The 0x58 byte indicates that the meta-event contains the time signature. There are 4 bytes of data. The first 2 bytes (0x03 and 0x02) are the numerator and the denominator of the time signature, where the denominator is a power of 2. Thus, the time signature is 3/4 (three beats to the measure, where a quarter note gets one beat).

The third and fourth bytes of data involve the relationship between metronome beats (which programs may use to help users play in time) and the MIDI Timing Clock message, which is used to synchronize sequencers. The Timing Clock message is the single byte 0xF8. Such messages are sent at the rate of 24 per quarter note.

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The third data byte in this meta-event is the number of MIDI clocks in a metronome click. I assumed here that we'd want a metronome click every quarter note, so the third byte is 24 or 0x18. The fourth data byte is the number of thirty-second notes per 24 MIDI clocks. Because 24 MIDI clocks correspond to a quarter note, this byte is set to 8.

The time signature meta-event does not affect how the MIDI file is played. It exists merely to indicate information about the music stored in the file.

The second meta-event is:

```
FF 51 03 07 A1 20
```

This is a tempo meta-event. The 3-byte value of 0x7A120 indicates 500,000 microseconds per quarter note, which is consistent with the tempo of 120 quarter notes per minute indicated in Figure 1.

The final meta-event has 0 bytes of data, FF 2F 00, indicating the end of the track. Each track must end with these 3 bytes.

MIDI MESSAGES AND RUNNING STATUS

The second track in Figure 2 contains 40 (0x28) bytes of data for playing the music on an extended synthesizer. The first event in the track is at offset 0x31 in the file and looks like 00 C0 13. That's a delta time of 0 and a MIDI Program Change message for channel 0 and instrument 0x13 (a church organ). This MIDI message sets the instrument to a church organ for all subsequent channel 0 messages.

The second event is 00 B0 07 7F, showing another delta time of 0 and a MIDI Control Change message. The message indicates that controller 7 (the main volume) for channel 0 should be set to 0x7F, the maximum volume.

Finally we're ready to play something. The bytes 00 90 3C 40 include another

delta time of 0 and a MIDI Note On message for channel 0. The note is middle C (key number 60 or 0x3C) with a velocity of 64 (0x40). These bytes play the first note.

The next event is 81 70 40 40. The first 2 bytes represent the delta time. This is an example I used earlier; it decodes into the number 0xF0 or 240. The header section of the file indicates that a quarter note is divided into 240 parts, so this represents a period of time corresponding to the length of a quarter note. The tempo meta-event discussed above makes a quarter note 500,000 microseconds long, so this event occurs precisely half a second after the previous event.

The next part of the event should be a MIDI message, but it sure doesn't look like one. The problem is that the first byte of a MIDI message (called the *status byte*) always has the high bit set, and the next byte following the delta time is 0x40. Well, MIDI files often use a technique called *running status* to reduce the size of the file: If a status byte is the same as the previous status byte, it may be omitted. Thus, the 2 bytes in the event are actually the MIDI Note On message 90 40 40. This plays an E above middle C (key number 64 or 0x40) with a velocity of 64 (0x40).

The next event is 81 70 43 40. The first 2 bytes represent another delay of a quarter-note length, and the second 2 bytes represent another Note On message for a G. The event that follows plays the final note at C an octave above middle C, 81 70 48 40. The four notes are now all playing; they should sound for the duration of three quarter notes.

The next event is 85 50 3C 00. Can you convert the delta times in your head yet? The first 2 bytes represent the delta time 0x02D0, or 720. That's 3 times the division value of 240, so the event occurs

three quarter notes (1.5 seconds) after the previous event. The next 2 bytes represent the MIDI Note On message 90 3C 00. Because the velocity byte is 0, this turns the C note off.

The next three events are 00 40 00, 00 43 00, and 00 48 00. The delta times are all 0, so the events occur in quick succession. The MIDI messages turn the other three notes off, and the music is complete. The track concludes with another 0 delta time and a meta-event for the end of the track, 00 FF 2F 00.

MIDI files often use a technique called running status to reduce the size of the file: If a status byte is the same as the previous status byte, it may be omitted.

The third track is exactly the same as the second except that the channel number for all the MIDI messages is 12 rather than 0. For example, the first MIDI message in the track is CC 13, which is a Program Change message for channel 12 (indicated by the low four bits of the status byte) to switch to instrument 0x13 (pipe organ).

You can create this MIDI file fairly easily using DEBUG and play it using either the Media Player included with Windows 3.1 or the MIDPLA program shown in the last issue. The three tracks are played simultaneously, and MIDI messages are sent to the MIDI Mapper device over both channels 0 and 12. If the MIDI Mapper refers to an extended synthesizer, the channel 12 messages are blocked, while the channel 0 messages are blocked if the music is playing on a base-level synthesizer.

This is how MIDI files for Windows 3.1 can be designed to play on both base-level and extended synthesizers. In the next issue we'll start putting together a program to record MIDI messages from a synthesizer keyboard (or other controller) and store them in a MIDI file. □

A Sample Midi File

```
0000:0000 4D 54 68 64 00 00 00 06 00 01 00 03 00 F0 4D 54 MThd.....MT
0000:0010 72 6B 00 00 00 13 00 FF 50 04 03 02 18 00 00 FF rk.....X.....
0000:0020 51 03 07 A1 20 00 FF 2F 00 4D 54 72 6B 00 00 00 Q... ../.MTrk...
0000:0030 28 00 C0 13 00 B0 07 7F 00 90 3C 40 81 70 40 40 (.....<0.p00
0000:0040 81 70 43 40 81 70 48 40 85 50 3C 00 00 40 00 00 .pC0.pH0.P<...0..
0000:0050 43 00 00 48 00 00 FF 2F 00 4D 54 72 6B 00 00 00 C..H.../.MTrk...
0000:0060 28 00 CC 13 00 BC 07 7F 00 9C 3C 40 81 70 40 40 (.....<0.p00
0000:0070 81 70 43 40 81 70 48 40 85 50 3C 00 00 40 00 00 .pC0.pH0.P<...0..
0000:0080 43 00 00 48 00 00 FF 2F 00 C..H.../.
```

Figure 2: This hexadecimal dump of a sample MIDI file shows the header chunk and three track chunks that contain the actual MIDI data.

JULY 1992, PC MAGAZINE DESCRIBES THE PERFECT PERSONAL COMPUTER.

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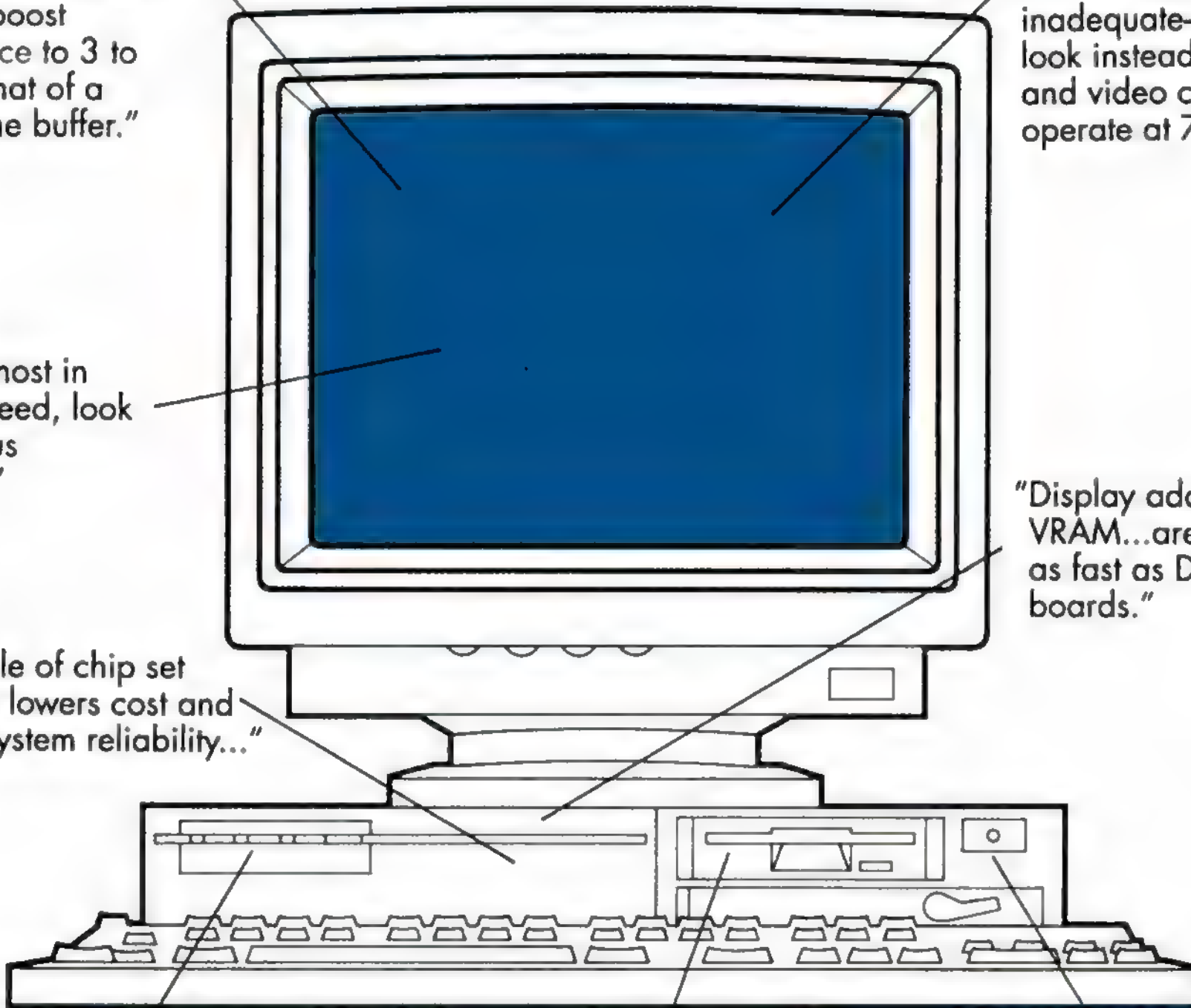
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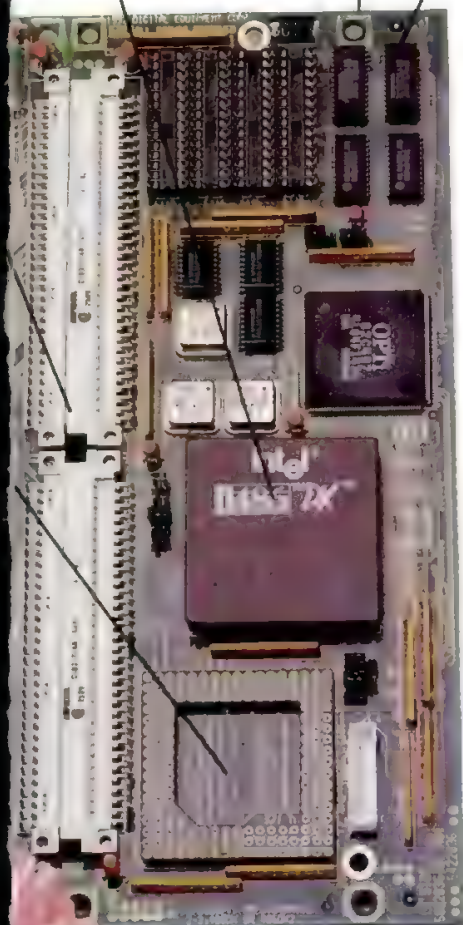
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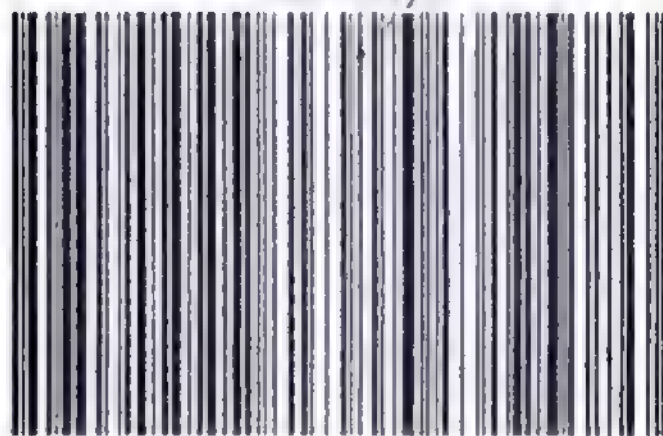
	DECpc 433dx LP	Compaq Deskpro 433/i	Dell P-Family 433
Upgradable	yes	yes	yes
Cache included	128KB	8KB	8KB
Cache maximum	256KB	64KB	256KB
GUI acceleration	yes	yes	no
Local bus video	yes	no	no
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1. Follow instructions on the other side

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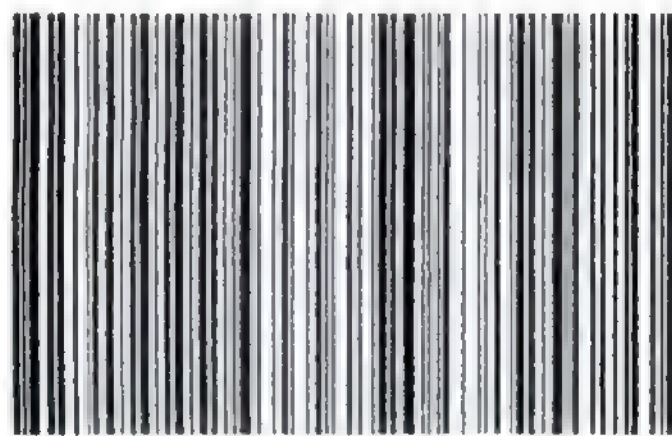
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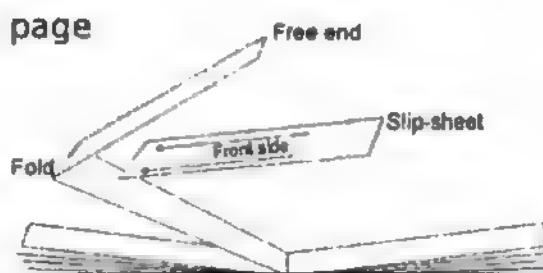


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1. Open the foldout page
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3. Slice the folded edge
4. Close the page and slip-sheet



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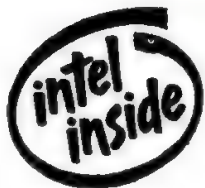
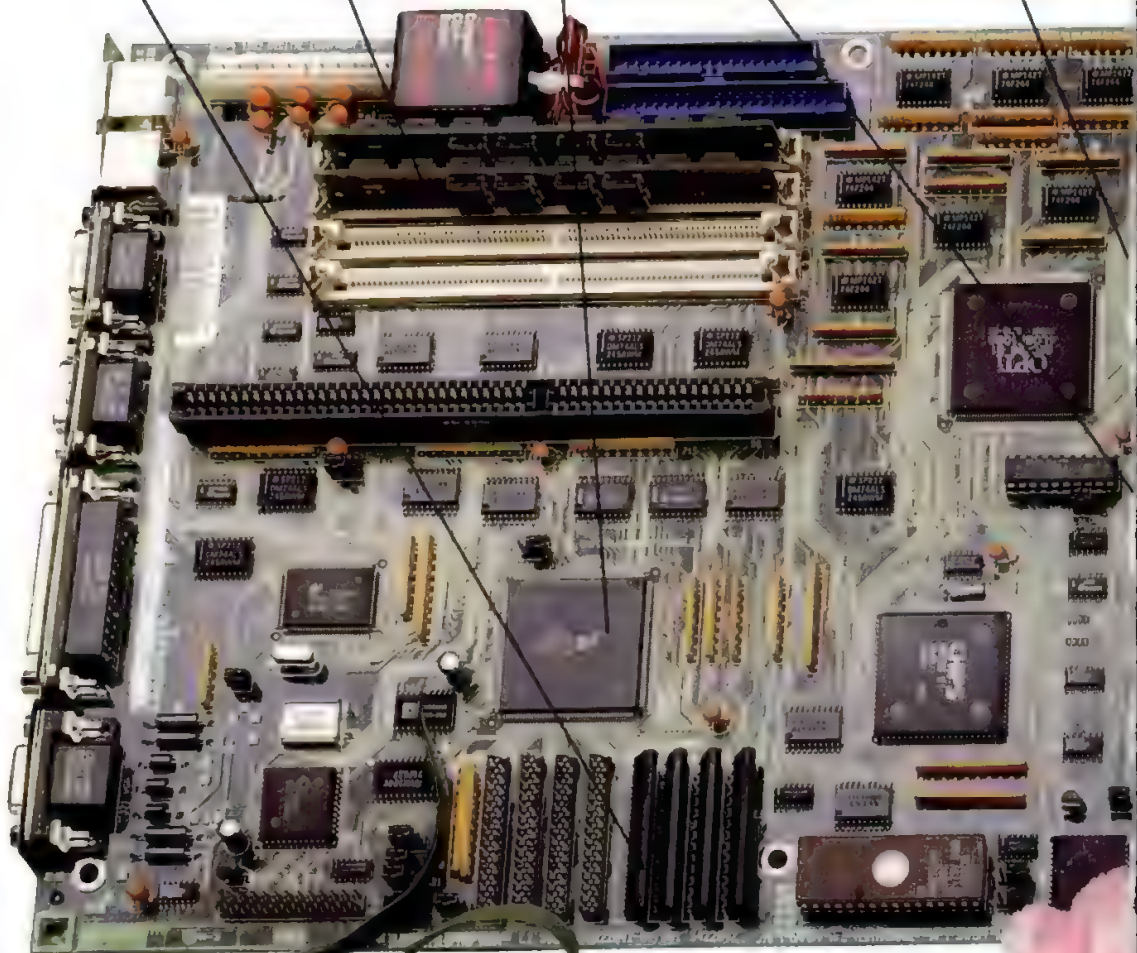
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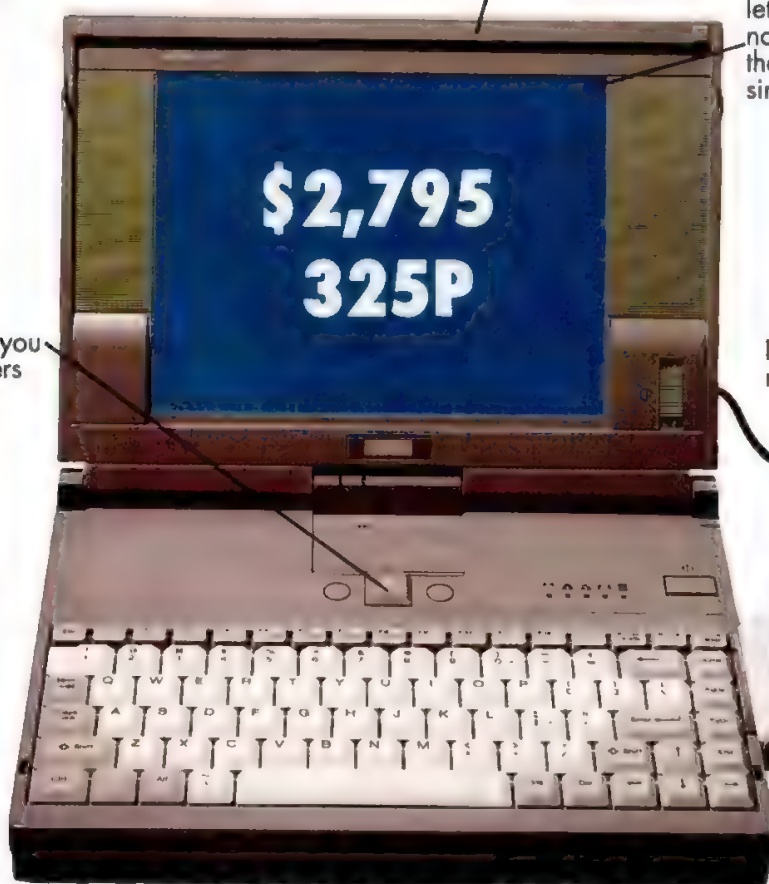
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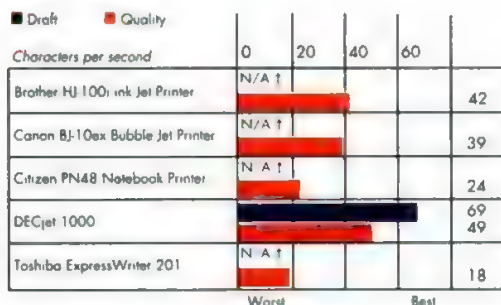
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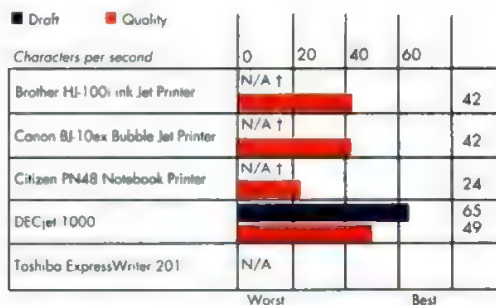


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POWER PROGRAMMING

Writing Portable Programs
For Windows

BY RAY DUNCAN

In the last column, I introduced you to the so-called WIN16, WIN32S, and WIN32 APIs. As you'll recall, we're using the term WIN16 for the 16-bit API of Windows 3.1, WIN32 for the expanded 32-bit API that was designed by Microsoft to compete with OS/2 2.0's 32-bit Presentation Manager API, and WIN32S for that subset of the WIN32 API that has direct counterparts in WIN16.

At the present time, WIN32 is supported only on Microsoft's new NT operating system for 386 and 486 processors and MIPS machines; a full-fledged WIN32 implementation that runs on top of DOS has been promised for 1993 (though I'm skeptical that it will ever materialize). In the meantime, Microsoft is supporting WIN32S on DOS and Windows 3.x with a special loader in a VxD and a "thunk" layer that translates 32-bit API calls by the application into 16-bit API calls. The exact same WIN32S binaries run on either Windows 3.x or NT/WIN32. As a temporizing solution, this is quite reasonable, and it should motivate many developers to move their applications to 32-bit mode much earlier than they would otherwise.

NT has many powerful and interesting features, but we're going to ignore them for a while yet and talk instead about the issue of source code portability between WIN16, WIN32S, and WIN32. Since WIN32S and WIN32 are supersets of WIN16, and WIN32S is almost exactly symmetric with WIN16, it's quite feasible to compile programs for either the WIN16 or WIN32 execution environment from the same source code base. The flat memory model of WIN32, the widening of integers from 16 bits to 32 bits, and the differences in calling con-

ventions are generally transparent, if sufficient attention is paid to the correct use of data types and handles. The other inescapable differences between the 16-bit and 32-bit programming interfaces are summarized in Figure 1.

Don't allow yourself to be intimidated by Figure 1; it may look like a long list of things to fret about, but in fact the items listed have surprisingly little impact

*Our sample program, a utility
for viewing a file in hex and
binary, demonstrates the
surprisingly easy portability
between the 16- and 32-bit
Windows environments.*

on application source code. The "vanished" functions are principally those that are CPU-architecture-dependent, and they must be dealt with on an individual basis. On the other hand, the semantics of the altered APIs and altered messages usually haven't changed, so most of the differences in that area can be handled by mechanical editing and conditional #defines in the application header file. For example, the changes to messages are almost always related to parameter packing—typically the movement of some value from lParam to wParam to allow for a 32-bit handle in lParam. The superseded functions are mostly sound functions that have been replaced by the multimedia API, or by relatively esoteric GDI functions related to coordinate spaces.

To help convince you that this easy portability from WIN16 to WIN32 isn't just standard Microsoft marketing hype but is in fact achievable, I'm going to follow up last issue's WINAPP application skeleton with a considerably more elaborate programming example. HEXVIEW, which can be seen in action in Figure 2, is a relatively mundane utility for viewing the contents of a file in hex and binary. Looking at the utility is worthwhile, though, because it demonstrates many of the aspects of a functional Windows application: It has a menu and an About dialog, it exploits the common dialog library, it performs file I/O, it selects a font, it paints text in its window, it maintains a scroll bar, and it saves and retrieves preference information about the size and location of its window and the name of the most recent file viewed. (Just to keep the full picture in perspective, the important Windows application tasks that HEXVIEW *doesn't* demonstrate are keyboard input, Clipboard operations, drag-and-drop, and DDE.) You can download HEXVIEW from PC MagNet, archived as HEXVIE.ZIP.

Pay attention now as we list all the ways that the HEXVIEW source code can be compiled and executed (see Figure 3) without any changes whatsoever! If HEXVIEW is compiled with BC++ 3.0, we get a 16-bit protected-mode NE binary that can run under Windows 3.x on 286, 386, or 486 processors; under NT on 386 or 486 processors using its Windows-On-Windows compatibility layer (WOW); or under NT on RISC processors using emulation technology that Microsoft has licensed from Insignia Corp. If HEXVIEW is compiled with Microsoft's CL386, we get a 32-bit protected-mode PE binary that can be run

under Windows 3.x on a 386 or 486 using the WIN32S translation DLLs and VxD, or under NT on a 386 or 486 as a native application. If HEXVIEW is compiled with the MIPS NT compiler, we get a 32-bit MIPS binary that can be run under NT on the R-4000 processor.

SOURCE CODE OVERVIEW The source code for HEXVIEW is listed in Figure 4, the header file in Figure 5, the resource script in Figure 6, and the module definition file in Figure 7. The header file consists mostly of function prototypes, except for a few arbitrary menu identifiers and some conditional #defines that we'll return to later. The resource script contains a totally standard, totally familiar Windows menu definition, dialog template, and icon declaration; we won't discuss their arcane syntax further here, except to remind you that it's the same for all of the target environments.

Turning to the source file, let's sort out the routines by their function and when they're executed, then look at the intent of each procedure in a little more detail.

- Application Infrastructure: WinMain, InitApp, InitInstance, TermInstance.
- Event Handling for the Frame Window: FrameWndProc, DoDestroy, DoClose, DoVScroll, ThumbTrack, DoSize, DoPaint, DoCommand, DoMenuOpen, DoMenuAbout, DoMenuExit.
- Event Handling for the Child Window: ChildWndProc, DoChildPaint.
- Event Handling for the About Dialog Box: AboutDlgProc.
- File Manipulation: OpenDataFile, ReadDataFile, GetByte.
- Helper Routines: DisplayLine, ConfigDisplay, Repaint, SetWindowCaption, SetFilePosition, UpdateFrameProfile.

It's a bit ironic that as a C program becomes more modular and structured, the procedures within the program become shorter and more numerous, and the source code correspondingly more difficult to understand without a road map or code-analysis tools. Good structured technique and modularity are, after all, supposed to improve the maintainability of a program, and so it does, but only after the usual learning curve. Newcomers to Windows programming also find it strange that a Windows program contains routines that are apparently never called from the main sequence of execution; only after they understand

Windows callbacks, events, and message-oriented architecture does the source code begin to make some kind of sense.

INFRASTRUCTURE PROCEDURES The procedures WinMain, InitApp, InitInstance, and TermInstance—along with the C runtime library startup code, which is linked into the program automatically and is invisible to us in this source listing—can be thought of as the program's infrastructure. When HEXVIEW is launched, the startup code first receives control, and after performing some housekeeping and several calls to Windows API functions, it transfers control to the WinMain routine.

WinMain calls or does not call InitApp according to the value of hInstance, one of its parameters. Under Windows 3.x, if hInstance is zero, this instance of HEXVIEW is the only one running, and InitApp must be called to register the application's window classes. If hInstance is nonzero under Windows 3.x, another instance is already running, and InitApp is bypassed. hInstance is always zero in a WIN32 or WIN32S environment, so InitApp will always be called when HEXVIEW is compiled as a 32-bit application.

Following the possible call to InitApp, WinMain calls InitInstance to create the application's frame window, size and position the window according to saved preferences from a previous execution of the program, get a handle for a nonproportional font, allocate some memory for a file I/O buffer, and reopen the file that was being viewed when the program was last executed. WinMain then falls into the famous (or infamous) Windows event

loop, retrieving messages from the task message queue and dispatching them to the appropriate window callback routine. When a WM_QUIT message is received, the "value" of GetMessage is zero and WinMain falls out of the loop, calls TermInstance to close the file and release the memory allocation, and then exits back to Windows. Wait a minute! Now that we've traced through WinMain from beginning to end and looked at every procedure that it calls, we still haven't seen where the real work of the program is accomplished! That's because the most important logic of the program is actually outside the main line of execution, in the event-handling routines.

EVENT-HANDLING PROCEDURES The front line of event handling for HEXVIEW is the routine FrameWndProc. Whenever the user moves or clicks the mouse on any part of HEXVIEW's window or hits a key while HEXVIEW has the input focus, or when any other event occurs that Windows thinks might be of interest to HEXVIEW, a message packet is placed in HEXVIEW's task queue. WinMain dequeues the message by calling GetMessage and passes the message to FrameWndProc by calling DispatchMessage. (FrameWndProc was designated as the message handler for HEXVIEW's frame window as part of the process of registering the window class in InitApp. DispatchMessage looks at the window handle in the message, looks up the appropriate message handler by backtracking from the window handle to the window class of which it is a member, and then "calls back" into HEXVIEW

Differences Between the WIN16 and WIN32 APIs

1 of 2

WIN16 Functions Not Supported in WIN32	WIN16 Functions Altered or Superseded in WIN32	WIN16 Messages Altered or Superseded in WIN32
AccessResource	AddFontResource	EM_GETSEL
AllocDStoCSAlias	CloseComm	EM_LINESCROLL
AllocResource	CloseSound	EM_SETSEL
AllocSelector	CountVoiceNotes	WM_ACTIVATE
ChangeSelector	DeviceCapabilities	WM_CHANGECHAIN
Dos3Call	DeviceMode	WM_CHARTOITEM
FreeSelector	DlgDirSelect	WM_COMMAND
GetCodeHandle	DlgDirSelectComboBox	WM_CTLCOLOR
GetCodeInfo	ExtDeviceMode	WM_DDE_ACK
GetCurrentPDB	FlushComm	WM_DDE_ADVISE
GetEnvironment	GetAspectRatioFilter	WM_DDE_DATA

Figure 1: Summary of the inescapable differences between the 16-bit and 32-bit programming interfaces. The functions in WIN32 that have no counterparts in WIN16 are not shown here.

PROGRAMMING

Power Programming

Differences Between the WIN16 and WIN32 APIs

2 of 2

WIN16 Functions Not Supported in WIN32	WIN16 Functions Altered or Superseded in WIN32	WIN16 Messages Altered or Superseded in WIN32
GetInstanceData	GetBitmapDimension	WM_DDE_EXECUTE
GetKBCodePage	GetBrushOrg	WM_DDE_POKE
GetTempDrive	GetClassWord	WM_HSCROLL
GlobalDosAlloc	GetCommError	WM_MDIACTIVATE
GlobalDosFree	GetCurrentPosition	WM_MDISETMENU
GlobalPageLock	GetMetaFileBits	WM_MENUCHAR
GlobalPageUnlock	GetModuleUsage	WM_MENUSELECT
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ProfInsChk	GetWindowExt	
ProfSampRate	GetWindowOrg	
ProfSetup	GetWindowWord	
ProfStart	MoveTo	
ProfStop	OffsetViewportOrg	
SetEnvironment	OffsetWindowOrg	
SetResourceHandler	OpenComm	
SwitchStackBack	OpenSound	
SwitchStackTo	ReadComm	
UngetCommchar	RemoveFontResource	
ValidateCodeSegments	ScaleViewportEx	
ValidateFreeSpaces	ScaleWindowEx	
	SetBitmapDimension	
	SetClassWord	
	SetCommMask	
	SetMetaFileBits	
	SetSoundNoise	
	SetViewportExt	
	SetViewportOrg	
	SetSoundAccent	
	SetVoiceEnvelope	
	SetVoiceNote	
	SetVoiceQueueSize	
	SetVoiceSound	
	SetVoiceThreshold	
	SetWindowExt	
	SetWindowOrg	
	SetWindowWord	
	StartSound	
	StopSound	
	SyncAllVoices	
	WaitSoundState	
	WriteComm	

at the message handler's entry point.)

When FrameWndProc is entered, the various components of the message currently being processed are on the stack: hWnd (the window handle), wParam (an integer value that indicates the message

type), and two parameters called lParam and lParam whose contents and significance depend on the message type. FrameWndProc looks up the message type in the table frameMsgs[] and, if it finds a match, passes the message to the

appropriate routine. If the message type isn't found in the table frameMsgs[], FrameWndProc passes it to the Windows API function DefWindowProc, which contains code for the default behavior for each message type.

The HEXVIEW procedures that are called by FrameWndProc are mostly small and straightforward. DoClose processes a WM_CLOSE message by calling UpdateFrameProfile to save the window's current size and position and the current filename and file pointer, then forcing a WM_DESTROY message by calling the Windows function DestroyWindow. DoDestroy processes the WM_DESTROY message by forcing a WM_QUIT message (which causes WinMain to fall out of its event loop). DoSize reacts to a window-resizing operation by calculating the number of lines that will now fit into the window, updating certain global variables, and calling ConfigWindow to configure the number of output lines that correspond to each scroll-bar unit and update the scroll bar on the screen accordingly.

The procedure DoCommand is called when FrameWndProc receives any sort of message from the menu bar, triggered by the user's mouse click on the menu bar or by accelerator keys for menu items. DoCommand decodes the message with the aid of the table menu-items[], then hands off control to DoMenuOpen, DoMenuExit, or DoMenuAbout to open a file, terminate the application, or display the About dialog box, respectively. DoMenuOpen calls the common dialog library routine GetOpenFileName to get a filename and uses the routines OpenDataFile, ReadDataFile, and Repaint to open the file, initialize the file I/O buffer and some global variables, and refresh the display in the main window. DoMenuExit responds by sending a WM_CLOSE message to the frame window, exactly as though the user had picked Close from the system menu, allowing shutdown processing to be unified in the routine DoClose. DoMenuAbout creates and displays the About dialog box, using the static dialog resource built into the executable file (by the resource compiler from the About dialog template in HEXVIEW.RC). Once the dialog is active, the callback routine AboutDlgProc grabs control until the dialog is dis-

Power Programming

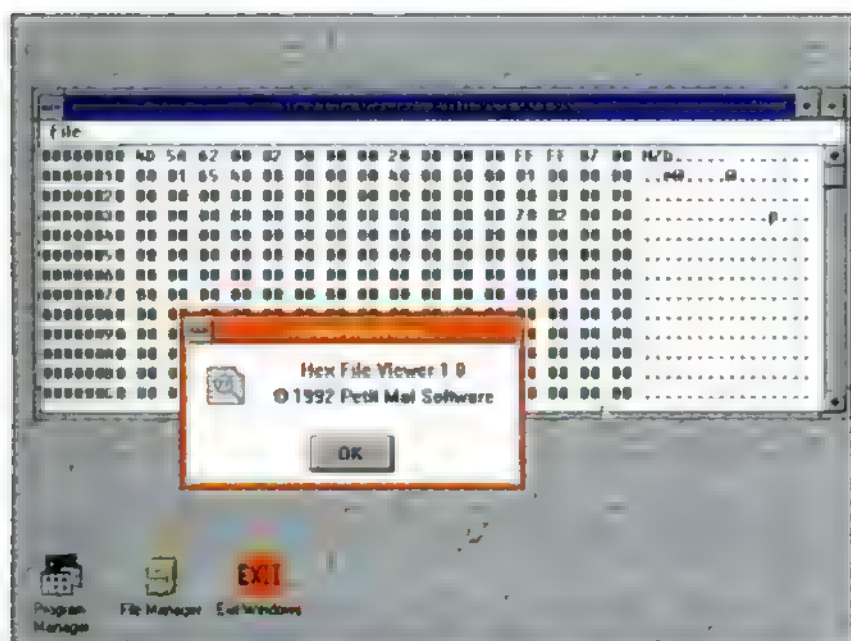


Figure 2: The HEXVIEW program in action.

missed by clicking the OK button.

The DoPaint routine is entered when a WM_PAINT message indicates that some part of the window needs updating. This message might be received because the window was moved, resized, iconized and then restored, or covered up and then revealed, or even because HEXVIEW intentionally sent a message to itself (in the routine Repaint) when a new file was opened or the file pointer was moved by the scroll-bar message-processing routine. DoPaint obtains a device context (DC), selects a nonproportional font into the device context using the font handle that was originally obtained by InitInstance, and then calls the helper routine DisplayLine to format and display each line of output within the window. DisplayLine uses the helper routine GetByte to extract each binary data byte from the file I/O buffer for conversion and formatting; any file I/O that is needed is hidden within GetByte.

DoVScroll is probably the most interesting message-handling routine in HEXVIEW. It is called whenever there is a vertical scroll-bar event—whenever the user clicks on the scroll bar, clicks on the arrows at the ends of the scroll bar, or drags the “thumb.” DoVScroll decodes the event type, calculates the new file position with the aid of the helper routine SetFilePosition, and updates the display accordingly (usually by calling Repaint to force a WM_PAINT message). There's more code in DoVScroll than you'd expect, mainly because we want to minimize the amount of time spent painting in the window. DoVScroll checks for cases where there is nothing to do or where it can BitBlt the current contents

of the window up or down by one line (using the Windows API function ScrollWindow), and then it lets DoPaint paint the “missing” line.

When the user drags the thumb, DoVScroll calls ThumbTrack to create a tiny child window in the middle of the main window, calculate the file offset that corresponds to the new thumb position, and send WM_PAINT messages to the child window's message handler, ChildWndProc. Child

WndProc decodes its message using the table childMsgs[] and calls DoChildPaint for WM_PAINT messages to display the file offset as feedback for the user. When the user releases the thumb, DoVScroll calculates the new file position and updates the main window. The destruction of the child window happens automatically in the helper routine SetFilePosition.

FILE MANIPULATION PROCEDURES

We've already discussed DoMenuOpen, which is called by FrameWndProc in response to a File Open menu command by the user. DoMenuOpen uses the common dialog library routine GetOpenFileName to retrieve a valid filename from the user, then calls OpenDataFile to open the file and fills the file I/O buffer by calling ReadDataFile. OpenDataFile initializes certain global variables including the file handle and current file position, reconfigures the scroll bar with the aid of ConfigDisplay, and puts the filename into the title bar by calling SetWindowCaption. OpenDataFile and ReadDataFile may also be called from InitInstance if a filename was saved by a previous execution of HEXVIEW.

From the standpoint of display logic (DoPaint and its helpers), the entire file

is always accessible in memory, and any given byte of the file can be retrieved by calling GetByte with a file offset. GetByte knows how much data and which part of the file is currently in the file I/O buffer and calls ReadDataFile whenever necessary to alter the contents of the buffer, implementing a sort of poor-man's virtual-memory scheme. SetFilePosition is called from many routines in the program but principally in response to scroll-bar events; it alters the global variables that indicate the current file position for display in the window and updates the scroll-bar thumb position accordingly, but does no file I/O. A call to Repaint, which typically follows SetFilePosition, causes DoPaint to execute via a forced WM_PAINT message; DoPaint's calls to GetByte will cause file I/O to occur if it is needed.

HELPER ROUTINES All of the helper routines are called indirectly by FrameWndProc as a result of message processing, and a few are also called by InitInstance to set up the display of a file that was open when HEXVIEW was last executed. Each of the helper routines has already been discussed in the context of event handling and file I/O procedures.

PORTABILITY CONSIDERATIONS Now that we've had a whirlwind tour through HEXVIEW, let's go back and see where portability considerations intrude into the source code.

First, we must remember that the general strategy in creating the WIN32 API from the WIN16 API was to widen all 16-bit parameters to 32 bits and to replace 32-bit segment:offset pointers with 32-bit flat-model near offsets. This aspect can be handled fairly completely by treating FAR as a NOOP for 32-bit code and by hiding the real data types behind TYPE-DEFS such as HWND, BOOL, INT, UINT, and LONG. If you look at the

Execution Environments for HEXVIEW

Compiled with	Windows 3.x on a 286 PC	Windows 3.x on a 386 or 486 PC	NT on a 386 or 486 PC	NT on a MIPS R-4000
BC++ 3.0	Yes (native)	Yes (as 16-bit app)	Yes (using WOW interface layer)	Yes (using emulation technology)
MS CL386	No	Yes (using WIN32S DLLs and VxD)	Yes (native)	No
MIPS CC	No	No	No	Yes (native)

Figure 3: These are the various ways the HEXVIEW source code can be compiled and executed.

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```
// HexView - Windows 3.x and NT/WIN32 Hex File Viewer
// Copyright (C) 1992 Ray Duncan
// PC Magazine - Ziff Davis Publications

#define dim(x) (sizeof(x) / sizeof(x[0])) // returns no. of elements
#define EXENAMESIZE 256 // max length of path+filename
#define BUFSIZE 65520 // size of file I/O buffer
#define BPL 16 // bytes per line

#include "stdlib.h"
#include "windows.h"
#include "string.h"
#include "comdlg.h"
#include "hexview.h"

HANDLE hInst; // module instance handle
HWND hFrame; // handle for frame window
HWND hChild; // handle for child window
HFONT hFont; // handle for nonprop. font
INT CharX, CharY; // character dimensions
INT LPP; // lines per page
INT BPP; // bytes per page
INT ThumbInc; // bytes per thumb unit
INT hFile = -1; // handle for current file
char szFileName[EXENAMESIZE+1]; // name of current file
HANDLE hBuff; // handle for file I/O buffer
LPSTR lpBuff; // far pointer to file buffer
LONG ViewPtr; // addr, first line current page
LONG FilePtr; // addr, start of i/o buffer
LONG FileSize; // length of current file
LONG FileIndex; // index from thumb tracking
LONG TopAddr; // address, top of last page
LONG TopLine; // line num, top of last page
INT WinWidth; // width of frame client area

char szFrameClass[] = "HexView"; // classname for frame window
char szChildClass[] = "HexViewChild"; // classname for child window
char szAppName[] = "Hex File Viewer"; // long application name
char szMenuName[] = "HexViewMenu"; // name of menu resource
char szIconName[] = "HexViewIcon"; // name of icon resource
char szIni[] = "Hexview.ini"; // initialization filename

char *szFilter[] = { // filters for Open dialog
    "All Files (*.*)", "*.**",
    "Executable files (*.EXE)", "*.EXE",
    "Object Modules (*.OBJ)", "*.OBJ",
    "" };

//
// Table of window messages supported by FrameWndProc()
// and the functions which correspond to each message.
//
struct decodeWord frameMsgs[] = {
    WM_PAINT, DoPaint,
    WM_SIZE, DoSize,
    WM_COMMAND, DoCommand,
    WM_CLOSE, DoClose,
    WM_DESTROY, DoDestroy,
    WM_VSCROLL, DoVScroll, };

//
// Table of window messages supported by ChildWndProc()
// and the functions which correspond to each message.
//
struct decodeWord childMsgs[] = {
    WM_PAINT, DoChildPaint, };

//
// Table of menu item IDs and their corresponding functions.
//
struct decodeWord menuitems[] = {
    IDM_OPEN, DoMenuOpen,
    IDM_EXIT, DoMenuExit,
    IDM_ABOUT, DoMenuAbout, };

//
// WinMain -- entry point for this application from Windows.
//
INT APIENTRY WinMain(HANDLE hInstance, LPSTR lpCmdLine, INT nCmdShow)
{
    MSG msg; // receives message packet

    hInst = hInstance; // save instance handle

    if(!hPrevInstance) // if first instance,
        if(!InitApp(hInstance)) // register window class
        {
            MessageBox(hFrame, "Can't initialize HexView!", szAppName,
                MB_ICONSTOP | MB_OK);
            return(FALSE);
        }

    if(!InitInstance(hInstance, nCmdShow)) // create instance window
    {
        MessageBox(hFrame, "Can't initialize HexView!", szAppName,
            MB_ICONSTOP | MB_OK);
        return(FALSE);
    }

    while(GetMessage(&msg, NULL, 0, 0)) // while message != WM_QUIT
    {
        TranslateMessage(&msg); // translate virtual key codes
        DispatchMessage(&msg); // dispatch message to window
    }

    TerminateInstance(hInstance); // clean up for this instance
    return(msg.wParam); // return code = WM_QUIT value
}

//
// InitApp --- global initialization code for this application.
// Registers window classes for frame and child windows.
//
BOOL InitApp(HANDLE hInstance)
{
    WNDCLASS wc; // window class data
    BOOL bParent, bChild; // status from RegisterClass

    // set parameters for frame window class
    wc.style = CS_HREDRAW | CS_VREDRAW; // class style
    wc.lpfnWndProc = FrameWndProc; // class callback function
    wc.cbClsExtra = 0; // extra per-class data
    wc.cbWndExtra = 0; // extra per-window data
    wc.hInstance = hInstance; // handle of class owner
    wc.hIcon = LoadIcon(hInst, "HexViewIcon"); // application icon
    wc.hCursor = LoadCursor(NULL, IDC_ARROW); // default cursor
    wc.hbrBackground = GetStockObject(WHITE_BRUSH); // background color
    wc.lpszMenuName = szMenuName; // name of menu resource
    wc.lpszClassName = szFrameClass; // name of window class

    bParent = RegisterClass(&wc); // register parent window class

    // modify some of the parameters for the child window class
    wc.style = 0; // class style
    wc.lpfnWndProc = ChildWndProc; // class callback function
    wc.lpszMenuName = NULL; // name of menu resource
    wc.lpszClassName = szChildClass; // name of window class

    bChild = RegisterClass(&wc); // register child window class

    return(bChild && bParent); // return combined status
}

//
// InitInstance --- instance initialization code for this application.
// Gets information about system nonproportional font. Allocates memory
// to use as file I/O buffer. Creates frame window, gets initialization
// information (if any) from INI file (Windows 3.x) or registration
// database (WIN32/NT). Positions and sizes window, opens and positions
// file if initialization info found.
//
BOOL InitInstance(HANDLE hInstance, INT nCmdShow)
{
    HDC hdc; // handle for device context
    TEXTMETRIC tm; // font information
    RECT rect; // window position & size
    char buff[80]; // scratch buffer

    hFrame = CreateWindow( // create frame window
        szFrameClass, // window class name
        szAppName, // text for title bar
        WS_OVERLAPPEDWINDOW | WS_VSCROLL, // window style
        CW_USEDEFAULT, CW_USEDEFAULT, // default position
        CW_USEDEFAULT, CW_USEDEFAULT, // default size
        NULL, // no parent window
        NULL, // use class default menu
        hInstance, // window owner
        NULL); // unused pointer

    if(!hFrame) return(FALSE); // error, can't create window

    hdc = GetDC(hFrame); // get device context
    hFont = GetStockObject(SYSTEM_FIXED_FONT);
    SelectObject(hdc, hFont); // realize nonproportional
    GetTextMetrics(hdc, &tm); // font, get character size.
    CharX = tm.tmAveCharWidth; // and calculate window width
    CharY = tm.tmHeight + tm.tmExternalLeading;
    WinWidth = (CharX * 75) + GetSystemMetrics(SM_CXVSCROLL);
    ReleaseDC(hFrame, hdc); // release device context

    if(!((hBuff = GlobalAlloc(GMEM_MOVEABLE, BUFSIZE))) // allocate memory
        return(FALSE); // error, out of memory

    lpBuff = GlobalLock(hBuff); // get far pointer to memory

    GetWindowRect(hFrame, &rect); // get window position, size

    // read saved position/size profile for our frame window, if any
    rect.left = GetPrivateProfileInt("Frame", "xul", rect.left, szIni);
    rect.top = GetPrivateProfileInt("Frame", "yul", rect.top, szIni);
    rect.right = GetPrivateProfileInt("Frame", "xlr", rect.right, szIni);
    rect.bottom = GetPrivateProfileInt("Frame", "ylr", rect.bottom, szIni);

    MoveWindow(hFrame, rect.left, rect.top, // force window position, size
        WinWidth, rect.bottom-rect.top, TRUE);
}
```

Figure 4: This is the C-language source code for HEXVIEW, a utility for viewing the contents of a file in hex and binary form.

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```
// get saved filename and file offset for display, if any
GetPrivateProfileString("File", "filename", "", szFileName,
    EXENAME_SIZE, szIni);
GetPrivateProfileString("File", "fileptr", "", buff, sizeof(buff), szIni);

if(szFileName[0]) // if filename and file offset
{
    // was saved from previous
    OpenDataFile(); // execution, open the file
    ReadDataFile(); // and set file position
    SetFilePosition(atol(buff));
}

ShowWindow(hFrame, nCmdShow); // make frame window visible
UpdateWindow(hFrame); // force WM_PAINT message
return(TRUE); // return success flag
}

//
// TerminateInstance -- instance termination code for this application.
// This is a general-purpose opportunity to clean up after ourselves.
//
BOOL TerminateInstance(HANDLE hInstance)
{
    if(hFile != -1) // close file if any
        _fclose(hFile);

    GlobalUnlock(hBuff); // unlock the memory buffer
    GlobalFree(hBuff); // release the buffer
    return(TRUE); // return success flag
}

//
// FrameWndProc --- callback function for application frame window.
// Decodes window message using table frameMsgs[] and runs corresponding
// function. If no match found, passes message to Windows DefWindowProc().
//
LONG FAR APIENTRY FrameWndProc(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    INT i;

    for(i = 0; i < dim(frameMsgs); i++)
    {
        if(wMsg == frameMsgs[i].Code)
            return((*frameMsgs[i].Fxn)(hWnd, wMsg, wParam, lParam));
    }

    return(DefWindowProc(hWnd, wMsg, wParam, lParam));
}

//
// ChildWndProc --- callback function for application child window.
// Works like FrameWndProc, except uses table childMsgs[].
//
LONG FAR APIENTRY ChildWndProc(
    HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    INT i;

    for(i = 0; i < dim(childMsgs); i++)
    {
        if(wMsg == childMsgs[i].Code)
            return((*childMsgs[i].Fxn)(hWnd, wMsg, wParam, lParam));
    }

    return(DefWindowProc(hWnd, wMsg, wParam, lParam));
}

//
// DoCommand -- processes WM_COMMAND messages for frame window.
// Decodes the menu item with the menuitems[] array, then
// runs the corresponding function to process the command.
// If no match found, passes message to Windows DefWindowProc().
//
LONG DoCommand(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    INT i;

    for(i = 0; i < dim(menuitems); i++)
    {
        if(wParam == menuitems[i].Code)
            return((*menuitems[i].Fxn)(hWnd, wMsg, wParam, lParam));
    }

    return(DefWindowProc(hWnd, wMsg, wParam, lParam));
}

//
// DoDestroy -- processes the WM_DESTROY message for frame window by
// posting a WM_QUIT message to the same window, forcing WinMain
// to fall out of the event loop.
//
LONG DoDestroy(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    PostQuitMessage(0);
    return(FALSE);
}
```

```
//
// DoClose -- processes a WM_CLOSE message for frame window by
// saving the current window position, size, filename, and file
// offset, then forcing a WM_DESTROY message.
//
LONG DoClose(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    UpdateFrameProfile(); // save window information
    DestroyWindow(hWnd); // then close down the app
    return(FALSE);
}

//
// DoVScroll -- process various WM_VSCROLL messages for frame window.
// The user can generate these messages by dragging thumb, clicking
// in scrollbar, or clicking arrows at both ends of scrollbar.
//
LONG DoVScroll(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    RECT rect;

    switch(LOWORD(wParam)) // LOWORD is vital for Win32
    {
        case SB_TOP: // go to top of file if
            if(ViewPtr) // we aren't there already
            {
                SetFilePosition(0);
                Repaint();
            }
            break;

        case SB_BOTTOM: // go to bottom of file if
            SetFilePosition(FileSize); // we aren't there already
            Repaint();
            break;

        case SB_LINEUP: // scroll up by one line if
            if(ViewPtr) // we aren't already at top
            {
                SetFilePosition(ViewPtr - BPL);
                ScrollWindow(hWnd, 0, CharY, NULL, NULL);
                UpdateWindow(hWnd);
            }
            break;

        case SB_LINEDOWN: // scroll down by one line if
            if(ViewPtr < TopAddr) // we aren't already at bottom
            {
                SetFilePosition(ViewPtr + BPL);
                ScrollWindow(hWnd, 0, -CharY, NULL, NULL);
                GetClientRect(hWnd, &rect);
                rect.top = max(0, (LPP-1) * CharY);
                InvalidateRect(hWnd, &rect, TRUE);
                UpdateWindow(hWnd);
            }
            break;

        case SB_PAGEUP: // scroll up by one page
            SetFilePosition(ViewPtr - BPP);
            Repaint();
            break;

        case SB_PAGEDOWN: // scroll down by one page
            SetFilePosition(ViewPtr + BPP);
            Repaint();
            break;

        case SB_THUMBPOSITION: // reposition file by thumb
            SetFilePosition(ThumbInc * (LONG) THUMBPOS);
            Repaint();
            break;

        case SB_THUMBTRACK: // track drag of thumb
            ThumbTrack(THUMBPOS);
            break;
    }

    return(FALSE);
}

//
// DoPaint -- process WM_PAINT message for frame window by
// painting hex and ASCII data dump for file offsets that fall
// within the window. We make no attempt to optimize this for
// painting regions that are smaller than the window.
//
LONG DoPaint(HWND hWnd, UINT wMsg, UINT wParam, LONG lParam)
{
    HDC hdc; // scratch device context
    PAINTSTRUCT ps; // scratch paint structure
    INT i;

    hdc = BeginPaint(hWnd, &ps); // get device context
    SelectObject(hdc, hFont); // realize nonprop. font

    if(hFile != -1) // paint all lines that
    { // fall within the window
        for(i = 0; i < LPP; i++)
    }
```


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```

    DisplayLine(hdc, i);
}

EndPoint(hwnd, &ps); // release device context
return(FALSE);

// DoChildPaint -- process WM_PAINT message for child window
// These occur during thumb drag; we put up a tiny window that
// displays the file offset corresponding to the thumb position.
LONG DoChildPaint(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    HDC hdc;
    PAINTSTRUCT ps;
    RECT rect;
    char buff[256];

    hdc = BeginPaint(hwnd, &ps); // get device context
    GetClientRect(hwnd, &rect); // get client area dimensions
    SelectObject(hdc, hFont); // select nonproportional font
    wprintf(buff, "%8dX", FileIndex); // format file index from thumb
    DrawText(hdc, buff, -1, // paint index into window
             &rect, DT_CENTER | DT_VCENTER | DT_SINGLELINE);
    EndPaint(hwnd, &ps); // release device context
    return(FALSE);

// DoSize -- process WM_SIZE message for frame window by calculating
// the number of lines per page and bytes per page for new window size.
// Also reposition the display if we were already at end of file and
// the window grew.
LONG DoSize(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    LPP = HIWORD(lParam) / CharY; // calc lines per page
    BPP = LPP * BPL; // calc bytes per page
    ConfigDisplay(); // calc display parameters
    if(ViewPtr > TopAddr) // make sure window refilled
        SetFilePosition(TopAddr);
    return(FALSE);

//
// DoMenuOpen -- process File-Open command from menu bar. All
// the hard work is done by the OpenFile common dialog.
//
LONG DoMenuOpen(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    OPENFILENAME ofn; // used by common dialogs

    szFileName[0] = '\0' // init filename buffer

    ofn.lStructSize = sizeof(OPENFILENAME); // length of structure
    ofn.hwndOwner = hwnd; // handle for owner window
    ofn.lpstrFilter = szFilter[0]; // address of filter list
    ofn.lpstrCustomFilter = NULL; // custom filter buffer address
    ofn.nFilterIndex = 1; // pick default filter
    ofn.lpstrFile = szFileName; // buffer for path+filename
    ofn.nMaxFile = EXNAMESIZE; // length of buffer
    ofn.lpstrFileTitle = NULL; // buffer for filename only
    ofn.lpstrInitialDir = NULL; // initial directory for dialog
    ofn.lpstrTitle = NULL; // title for dialog box
    ofn.Flags = OFN_PATHMUSTEXIST | OFN_FILEMUSTEXIST;
    ofn.lpstrDefExt = NULL; // default extension

    if(GetOpenFileName(&ofn)) // display open dialog
    {
        OpenDataFile(); // open file for viewing
        ReadDataFile(); // initialize data buffer
        Repaint(); // force display of data
    }

    return(FALSE);

//
// DoMenuExit -- process File-Exit command from menu bar. This
// is simply handled by sending a WM_CLOSE message as though Close
// had been picked on the System menu to shut down the app.
//
LONG DoMenuExit(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    SendMessage(hwnd, WM_CLOSE, 0, 0);
    return(FALSE);

//
// DoMenuAbout -- process File-About command from menu bar. We
// allocate a thunk for the dialog callback routine, display the
// dialog, then release the thunk after the dialog is dismissed.
//
LONG DoMenuAbout(HWND hwnd, UINT wMsg, UINT wParam, LONG lParam)
{
    WNDPROC lpProcAbout;

    lpProcAbout = MakeProcInstance((WNDPROC)AboutDlgProc, hInst);
    DialogBox(hInst, "AboutBox", hwnd, lpProcAbout);
    FreeProcInstance(lpProcAbout);
    return(FALSE);
}

//
// AboutDlgProc -- This is the callback routine for the About... dialog.
//
BOOL FAR APIENTRY AboutDlgProc (HWND hwnd, UINT msg, WPARAM wParam, LPARAM lParam)
{
    if((msg==WM_COMMAND) && (wParam==IDOK)) // dismiss dialog if OK
        EndDialog(hwnd, 0); // button was clicked,
    return(FALSE); // otherwise do nothing
}

//
// SetWindowCaption -- concatenate the filename with the application
// name, then update the frame window's title bar.
VOID SetWindowCaption(char * szFilename)
{
    char szTemp[EXNAMESIZE+1];

    strcpy(szTemp, szAppName); // get application name
    strcat(szTemp, " - "); // add separator
    strcat(szTemp, szFileName); // add filename
    SetWindowText(hFrame, szTemp); // put result into title bar
}

//
// Repaint -- force refresh of formatted output in main window. This
// gets called at various points when the file position is changed.
//
VOID Repaint(VOID)
{
    InvalidateRect(hFrame, NULL, TRUE); // repaint entire window
}

//
// SetFilePosition - called during processing of various vertical scrollbar
// messages to set ViewPtr to a valid value.
//
VOID SetFilePosition(LONG NewViewPtr)
{
    if(hChild) // destroy the child window
    {
        DestroyWindow(hChild); // if it happens to be active
        hChild = (HWND) 0;
    }

    if(hFile == -1) // bail out if no file open
        return;

    ViewPtr = NewViewPtr & 0xFFFFFFFF; // offset is multiple of 16

    if(ViewPtr > TopAddr) // enforce legal file offset
        ViewPtr = TopAddr;
    if(ViewPtr < 0)
        ViewPtr = 0;

    SetScrollPos(hFrame, SB_VERT, ViewPtr/ThumbInc, TRUE); // set thumb on scrollbar

//
// ConfigDisplay -- Configure various display parameters and scrollbar
// range according to current window size and file size.
//
VOID ConfigDisplay(VOID)
{
    // calc address and line number of first line, last page
    TopAddr = max((FileSize - 1) & 0xFFFFFFFF - BPP, 0);
    TopLine = TopAddr / BPL;

    // calculate bytes per scrollbar increment
    ThumbInc = BPL * ((TopLine/32767) + 1);

    // configure vertical scrollbar or make it disappear if not needed
    if(BPP >= FileSize) // file fits within window
    {
        SetScrollRange(hFrame, SB_VERT, 0, 0, FALSE);
        SetScrollPos(hFrame, SB_VERT, 0, TRUE);
        if(ViewPtr) SetFilePosition(0);
    }
    else // file is too big for window
    {
        SetScrollRange(hFrame, SB_VERT, 0, (TopLine*BPL)/ThumbInc, FALSE);
        SetScrollPos(hFrame, SB_VERT, ViewPtr/ThumbInc, TRUE);
    }

//
// ThumbTrack() - called during processing of WM_VSCROLL message to track
// thumb position, also forcing update of file offset in child window.
//
VOID ThumbTrack(INT pos)
{
}

```

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```
RECT rect;
INT SizeX = CharX * 10;           // calc size of child window
INT SizeY = CharY * 2;

if(!hChild)                       // create child window
{
    GetClientRect(hFrame, &rect);  // get client area of frame

    hChild = CreateWindow(         // create child window
        szChildClass,             // window class name
        NULL,                     // text for title bar
        WS_CHILD | WS_BORDER | WS_VISIBLE, // window style
        (rect.right-SizeX) / 2,    // x position
        (rect.bottom-SizeY) / 2,   // y position
        SizeX,                   // window width
        SizeY,                   // window height
        hFrame,                   // frame is parent window
        (HMENU) 1,                // child window ID
        hInst,                    // window owner module
        NULL);                    // unused pointer
}

// calculate file location to display, force repaint of child window
FileIndex = min((LONG) pos * (LONG) ThumbInc, TopAddr);
InvalidateRect(hChild, NULL, TRUE);
}

//
// DisplayLine -- format and display a single line of hex/ASCII dump
// using the device context and relative window line number supplied
// by the caller. The file data offset is calculated from the
// relative window line and the offset corresponding to the line
// currently at the top of the window.
//
VOID DisplayLine(HDC hdc, INT line)
{
    INT i;
    char buff[256], c, *p;
    LONG x;

    if((ViewPtr + (LONG) line*BPL) < FileSize)
    {
        // format file offset as 8-digit hex number
        p = buff + sprintf(buff, "%08lx ", ViewPtr + (LONG) line*BPL);

        // format this 16-bytes as hex data
        for(i = 0; i < BPL; i++)
        {
            x = ViewPtr + (LONG)(line * BPL) + i;

            if(x < FileSize)
                p += sprintf(p, "%02X ", GetByte(x) & 0xff);
            else
                p += sprintf(p, "   ");
        }

        // format same 16-bytes as ASCII, using "." for control characters
        for(i = 0; i < BPL; i++)
        {
            x = ViewPtr + (LONG)(line * BPL) + i;

            if(x < FileSize)
            {
                c = GetByte(x);
                if(c < 0x20)
                    c = '.';
            }
            else c = ' ';
            *p++ = c;
        }

        // append a null byte, then paint the formatted data
        *p = '\0';
        TextOut(hdc, 0, line*CharY, buff, strlen(buff));
    }
}

//
// GetByte -- retrieve data byte from file I/O buffer, performing
// disk I/O as necessary. This is a simple-minded virtual memory
// scheme when file is larger than buffer.
//
char GetByte(LONG addr)
```

```
{
    if(!((addr >= FilePtr) && (addr < (FilePtr + BUFSIZE))))
    {
        FilePtr = (addr - (BUFSIZE/2)) & 0xffffffff;
        if(FilePtr < 0) FilePtr = 0;
        ReadDataFile();
    }

    return(lpBuff[addr - FilePtr]);
}

//
// OpenDataFile -- open specified file for viewing, save handle. The
// filename was previously placed in szFileName by OpenFile common dialog.
//
VOID OpenDataFile(VOID)
{
    if(hFile != -1)                // close previous file if any
        _fclose(hFile);

    hFile = _lopen(szFileName, OF_READ); // try and open the new file

    if(hFile == -1)                // bail out if no such file
    {
        MessageBox(hFrame, "Can't open file!", szAppName, MB_ICONSTOP|MB_OK);
        return;
    }

    FileSize = _llseek(hFile, 0, 2); // get size of file
    ViewPtr = 0;                    // reset window address pointer
    FilePtr = 0;                    // reset file i/o pointer
    ConfigDisplay();                // calc display parameters
    SetWindowCaption(szFileName);   // update title bar
}

//
// ReadDataFile -- read data from specified file to I/O buffer, using
// current file position set by caller.
//
VOID ReadDataFile(VOID)
{
    if(hFile == -1)                // bail out if no file open
        return;
    _llseek(hFile, FilePtr, 0);     // position file pointer
    _lread(hFile, lpBuff, BUFSIZE); // read the file
}

//
// UpdateFrameProfile() -- Update frame window profile in INI file
// (if Win 3.x) or registration database (if NT/WIN32) by saving the
// current window position, size, name of file being displayed, file offset.
//
VOID UpdateFrameProfile(VOID)
{
    RECT rect;
    char temp[20];

    if(IsIconic(hFrame) || IsZoomed(hFrame)) return;

    GetWindowRect(hFrame, &rect); // get position of frame window

    sprintf(temp, "%d", rect.left);
    WritePrivateProfileString("Frame", "xul", temp, "HexView.ini");

    sprintf(temp, "%d", rect.top);
    WritePrivateProfileString("Frame", "yul", temp, "HexView.ini");

    sprintf(temp, "%d", rect.right);
    WritePrivateProfileString("Frame", "xlr", temp, "HexView.ini");

    sprintf(temp, "%d", rect.bottom);
    WritePrivateProfileString("Frame", "ylr", temp, "HexView.ini");

    WritePrivateProfileString("File", "filename", szFileName, "HexView.ini");

    sprintf(temp, "%ld", ViewPtr);
    WritePrivateProfileString("File", "fileptr", temp, "HexView.ini");
}
```

variable declarations and at the function prototypes and declarations, you'll see that they almost uniformly use TYPEDEFS in preference to real or native data types. You'll also notice that a few of the TYPEDEFS are strategically remapped for the two different execution environments in the HEXVIEW.H header file

(the remainder are handled in WINDOWS.H, which will handle all of them in the final versions of the development systems).

Second, we must take into account the different calling conventions in WIN16 and WIN32. WIN16 applications use a mixture of the CDECL calling conven-

tion (parameters are pushed right to left, and the caller clears the stack) and the PASCAL calling convention (parameters are pushed left to right, and the called item clears the stack). In general, routines that are entered directly from Windows (message and dialog callbacks) are declared as FAR PASCAL, while the

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HEXVIEW.H

Complete Listing

```
//
// HexView.H -- Header File for HexView.C
//

#if defined(WIN32)

#define WIN16 TRUE
#define WIN31

#define INT int
#define UINT WORD
#define APIENTRY PASCAL
#define WNDPROC FARPROC
#define THUMBPOS LOWORD(lParam)

#else

#define WIN16 FALSE
#define THUMBPOS HIWORD(wParam)

#endif

struct decodeWord { // structure associates
    UINT Code; // messages or menu IDs
    LONG (*Fxn)(HWND, UINT, UINT, LONG); // with a function
};

#define IDM_OPEN 100
#define IDM_EXIT 101
#define IDM_ABOUT 102

// Function prototypes
INT APIENTRY WinMain(HANDLE, HANDLE, LPSTR, INT);
BOOL InitApp(HANDLE);
BOOL InitInstance(HANDLE, INT);
BOOL TerminateInstance(HANDLE);
LONG FAR APIENTRY FrameWndProc(HWND, UINT, UINT, LONG);
LONG FAR APIENTRY ChildWndProc(HWND, UINT, UINT, LONG);
BOOL FAR APIENTRY AboutDlgProc(HWND, UINT, UINT, LONG);
LONG DoDestroy(HWND, UINT, UINT, LONG);
LONG DoClose(HWND, UINT, UINT, LONG);
LONG DoPaint(HWND, UINT, UINT, LONG);
LONG DoChildPaint(HWND, UINT, UINT, LONG);
LONG DoSize(HWND, UINT, UINT, LONG);
LONG DoCommand(HWND, UINT, UINT, LONG);
LONG DoVScroll(HWND, UINT, UINT, LONG);
LONG DoMenuOpen(HWND, UINT, UINT, LONG);
LONG DoMenuExit(HWND, UINT, UINT, LONG);
LONG DoMenuAbout(HWND, UINT, UINT, LONG);
VOID OpenDataFile(VOID);
VOID ReadDataFile(VOID);
VOID SetWindowCaption(char *);
VOID Repaint(VOID);
VOID SetFilePosition(LONG);
VOID ConfigDisplay(VOID);
VOID ThumbTrack(INT);
VOID DisplayLine(HDC hdc, INT line);
char GetByte(long);
VOID UpdateFrameProfile(VOID);
```



Figure 5: This is the C-language header file for the HEXVIEW utility.

procedures that are called only from within the application itself are declared as NEAR or FAR CDECL.

In WIN32, on the other hand, all calls are NEAR because of the flat memory model, and by default the compiler uses a hybrid calling convention named STDCALL where parameters are pushed right to left but the callee clears the stack. These differences are disguised in the source code by again treating FAR as a NOOP for 32-bit code and by hiding the actual calling convention beneath #defines such as APIENTRY, CALLBACK, and WNDPROC.

Amazingly, if we've been careful not to use any of the API functions in our program that are not completely symmetric between WIN16 and WIN32, the masking of data types and calling conventions handles about 90 percent of the portability considerations for WIN16 and WIN32.

Message packets and message-parameter packing constitute most of the rest of our worries. WIN16 message packets have three 16-bit components (hWnd, wParam, and lParam) and one 32-bit component (lParam). WIN32 message packets have four components with the same names, but all are 32-bit. Just as with the API function parameters, this difference is concealed behind TYPE-DEFS (UINT and LONG).

The issue of parameter packing is a little more tricky. We first look at all the

messages processed by routines intrinsic to our program (these are nicely summarized in the tables frameMsg[] and childMsgs[]) and compare them to the list of messages in Figure 2 that were redefined for WIN32. The one message that turns up as a potential problem for HEXVIEW is WM_VSCROLL. Turning now to the programmers' references for WIN16 and WIN32, we find the following information:

- WIN16 WM_VSCROLL: wParam = scroll event type (SB_LINEUP, SB_PAGEUP, and so forth); lParam = window handle in high word, thumb posi-

tion in low word (if applicable).

- WIN32 WM_VSCROLL: wParam = scroll event type (SB_LINEUP, SB_PAGEUP, and so forth) in low word, thumb position in high word (if applicable); lParam = window handle.

Some of these differences are easily handled with the conditional #defines of the general form:

```
#if defined(WIN32)
#define THUMBPOS HIWORD(wParam)
#else
#define THUMBPOS LOWORD(lParam)
#endif
```

HEXVIEW.RC

Complete Listing

```
// Resource script for HEXVIEW.C
#include "windows.h"
#include "hexview.h"
HexViewIcon ICON hexview.ico
HexViewMenu MENU
BEGIN
    POPUP "&File"
    BEGIN
        MENUITEM "&Open", IDM_OPEN
        MENUITEM "E&xit", IDM_EXIT
        MENUITEM SEPARATOR
        MENUITEM "A&bout", IDM_ABOUT
    END
END
AboutBox DIALOG 22, 17, 126, 53
CAPTION "About HexView..."
STYLE DS_MODALFRAME | WS_CAPTION | WS_SYSMENU
BEGIN
    ICON "HexViewIcon", -1, 7, 8, 16, 16, WS_CHILD | WS_VISIBLE
    CTEXT "Hex File Viewer 1.0", -1, 33, 6, 84, 8
    CTEXT "\251 1992 Petit Mal Software", -1, 32, 16, 87, 9
    CONTROL "OK", IDOK, "BUTTON", WS_GROUP, 47, 35, 32, 14
END
```



Figure 6: This is the resource script for the HEXVIEW utility.

Power Programming

then referencing the symbol THUMBPOS in the source code wherever the thumb position is needed. (Microsoft recommends use of its "message cracker" macros instead, but I found them ugly and clumsy, and gave up on them almost immediately.) The remainder of environmental differences between WM_VSCROLL messages are accounted for by using LOWORD (wParam) whenever the scroll event type is examined; the LOWORD does no harm in WIN16 and ensures the proper isolation of the scroll event type in WIN32.

One very important divergence between the WIN16 and WIN32 environments, which does not show up in our HEXVIEW code at all, is the handling of the information that is stored and retrieved by the Windows functions WritePrivateProfileString, GetPrivateProfileString, and GetPrivateProfileInt. In Windows 3.x, this information is stored in a plain ASCII text file named (in this case) HEXVIEW.INI in the C:\WINDOWS directory. Under NT, the information is stored in an indexed binary da-

tabase on a per-user basis, protected by access control lists.

As it stands, HEXVIEW is a WIN32S application and takes no special advantage of NT's capabilities when running as a 32-bit program. NT-specific enhancements can easily be added via conditional compilation, but these will tend to make the source code more confusing, so the potential performance gains must be weighed against the damage to maintainability. Our first inclination might be simply to make the file I/O buffer a lot bigger under WIN32 (since the flat memory model makes access to multimegabyte data objects very efficient). But this would probably slow the program down, rather than speed it up. The allocation of a huge buffer will stir up a lot of activity in the system's virtual memory manager, and in the case of very large files HEXVIEW will waste time reading data that is never needed. A much better solution under NT would use its mapped file functions, which essentially associate offsets within a disk file with a range of memory addresses, and would shift the

HEXVIEW.DEF

Complete Listing

```
NAME      HexView
DESCRIPTION 'HexView - Windows Hex Viewer'
EXETYPE   WINDOWS
STUB      'WINTUB.EXE'
CODE      PRELOAD MOVEABLE
DATA      PRELOAD MOVEABLE MULTIPLE
HEAPSIZE  32768
STACKSIZE 8192

EXPORTS
  FindWndProc
  AboutDlgProc
  ChildWndProc
```



Figure 7: This is the module definition file for the HEXVIEW utility.

entire burden of file I/O onto the system's paged memory manager.

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DATABASES

Counting the Days: DAYS.PRG tells you how often a weekday occurs. FoxPro Printing Snag: Beware of clients installing printer drivers.

BY SAL RICCIARDI

Counting the Days

A dBASE III Plus application I recently developed required calculation of the number of times that each day of the week occurs within a given range of dates. The program shown in Figure 1 illustrates the procedure I used. It requires a database of seven records (one for each day of the week) and two numeric field defini-

tions: `seq_nbr` (length 1) and `occurs` (length 4 or more). The logic is this: Divide the total number of days in a date range by 7. The number of occurrences of each day is the quotient. If there is a remainder (R), add one occurrence to the day on which the range began and to each of the next R-1 days.

Roger W. Sauer
Fairfield, California

► **PC MAGAZINE** If you need to count the number of times a specific day occurs within a date range, this technique could come in handy. Some possible applications might be determining the number of workdays within a calendar period or counting the number of attendance days in a school semester.

The program shown in Figure 2 is a slight variation of the one shown in Fig-

DAYS.PRG

Complete Listing

```
* DAYS.PRG
* This program calculates the number of times each day of the week
* occurs within a given range of dates. dBASE III Plus.
*
SET TALK OFF
CLEAR

STORE CTOD(" / / ") TO beg_date,end_date

@ 3,3 SAY "Enter beginning date:" GET beg_date
@ 5,3 SAY "Enter ending date: " GET end_date
READ

numdays = end_date - beg_date + 1
day_nbr = DOW(beg_date)
USE days

REPLACE ALL ;
  seq_nbr WITH RECNO() - day_nbr + IIF(RECNO() < day_nbr,8,2), ;
  occurs WITH INT(numdays / 7) + IIF(seq_nbr <= MOD(numdays,7),1,0)
END OF VFP
```

```
?
? "Number of Sundays is " + STR(occurs)
SKIP
? "Number of Mondays is " + STR(occurs)
SKIP
? "Number of Tuesdays is " + STR(occurs)
SKIP
? "Number of Wednesdays is" + STR(occurs)
SKIP
? "Number of Thursdays is " + STR(occurs)
SKIP
? "Number of Fridays is " + STR(occurs)
SKIP
? "Number of Saturdays is " + STR(occurs)
?
USE
RETURN
```



Figure 1: DAYS.PRG calculates the number of times each day of the week occurs within a given range of dates.

DAYS2.PRG

Complete Listing

```
* DAYS2.PRG
* This program calculates the number of times each day of the week
* occurs within a given range of dates. dBASE IV.
*
SET TALK OFF
CLEAR
STORE CTOD(" / / ") TO beg_date,end_date

@ 3,3 SAY "Enter beginning date:" GET beg_date
@ 5,3 SAY "Enter ending date: " GET end_date
READ

?
? "Number of Sundays is " + STR(DayOccurs(beg_date,end_date,1))
? "Number of Mondays is " + STR(DayOccurs(beg_date,end_date,2))
? "Number of Tuesdays is " + STR(DayOccurs(beg_date,end_date,3))
? "Number of Wednesdays is" + STR(DayOccurs(beg_date,end_date,4))
? "Number of Thursdays is " + STR(DayOccurs(beg_date,end_date,5))
? "Number of Fridays is " + STR(DayOccurs(beg_date,end_date,6))
? "Number of Saturdays is " + STR(DayOccurs(beg_date,end_date,7))
?
```

```
*****
* FUNCTION DayOccurs
* Returns the number of times a day occurs in a date
* range. For example, to find how many Sundays there
* are in between 1/15/91 and 1/31/91 use:
*
* startd = CTOD("01/15/91")
* endd = CTOD("01/31/91")
* answer = DayOccurs(startd, endd, 1)
*
* 1 means Sunday, 2 means Monday etc.
*
FUNCTION DayOccurs
PARAMETERS begdate, enddate, daynumb
PRIVATE numdays, dayofw, x, result
numdays = enddate - begdate + 1
dayofw = DOW(begdate)
x = daynumb - dayofw + IIF(daynumb < dayofw,8,1)
RETURN INT(numdays/7) + IIF(x <= MOD(numdays,7),1,0)
```



Figure 2: DAYS2.PRG is a slight variation of DAYS.PRG, shown in Figure 1. It uses the DayOccurs function.

ure 1. Our version encapsulates Mr. Sauer's algorithm and places it in a generic function called DayOccurs. For example, in order to determine the number of Sundays that occurred in 1991, you could call DayOccurs as follows using dBASE IV:

```
DayOccurs({01/01/91},{12/31/91},1)
```

You can download both programs from PC MagNet archived as DAYS.ZIP.

FoxPro Printing Snag

FoxPro lets you control your printer so that it prints boldface or compressed print, 6 or 8 lines per inch, and so on. The usual method of doing this is to concatenate character values to a string variable and use the ??? command to send the values directly to the printer.

Recently one of my clients reported a mystifying printer bug. An application I wrote was not controlling his printer properly. Had he changed printers? No. The code was correct; it ran fine on my printer, which uses the same control codes as the client's. The cause of the problem was this: The client had installed a FoxPro 2.0 printer driver setup in his FOXUSER Resource file! When a printer driver is installed and a call is made to a printing application, the driver initializes the printer, clearing any previous control codes.

When FoxPro 2.0 has a printer driver setup installed and such a call (LABEL FORM, REPORT FORM...) is made, FoxPro 2.0 appears to initialize the printer in accordance with the printer driver setting. This effectively nullifies any control codes previously sent to the printer and returns the printer to its default state.

So if you have sent the printer control codes using the ??? command in order to print italics, boldface, 8 lines per vertical inch, or whatever, and a printer driver has been installed, things may not work as expected.

To get around this, I now issue a

```
SET PDSETUP TO
```

in my start-up code for my applications. This clears out any previous printer driver the user may have installed. (Users

can set a printer driver via the System Menu, File Submenu, Printer Setup choice.)

Jeff Hewitt

Highland, California

► **PC MAGAZINE** The printer drivers introduced in FoxPro 2.0 are designed to let you use printer-specific features in your reports and labels. The printer driver specification identifies the names of a number of procedures FoxPro calls at certain times. These procedures are supposed to return to FoxPro a string of characters or control codes to be sent to the printer.

For example, procedures are called before, during, and after a report is printed using REPORT FORM. The PDDOCST procedure in the printer driver is the document start procedure, and it is called before a report is printed. The value returned to FoxPro from PDDOCST is sent to your printer before the report is printed. In many printer drivers, this procedure will reset the printer to a known state. Similarly, there's a PDDOCEND procedure that is called when a report is finished.

You can set a default printer driver using the Printer Setup dialog from FoxPro's File pull-down menu. There you'll see a check box called Printer Driver Setup that, when checked, brings up the Printer Driver Setups dialog, which contains a list of installed printer drivers. From there you can add new drivers, edit and delete existing ones, and so on. To make the highlighted printer driver the default driver, you choose the Set Default push button. This places the name of the default printer driver in FoxPro's resource file, where FoxPro will find it automatically whenever it starts up.

There are three methods you can use to override the setting in the resource file. The first is, of course, to use the FoxPro Printer Driver Setup dialog to select a different driver. The second is to include the line

```
PDSETUP = 'drivername'
```

in your CONFIG.FP FoxPro configuration file. When FoxPro starts up, it will load the driver specified in the resource file first and then process CONFIG.FP, so any driver specified in CONFIG.FP

will override the one specified in the resource file. Finally, there's the SET PDSETUP TO command.

You can use the SET PDSETUP TO command in your applications to specify a printer driver. It has no effect on the setting in the resource file. It just temporarily installs a new printer driver.

If you issue the command without specifying a driver, the existing one is cleared (turned off). Therefore, if you want to upgrade a pre-2.0 application that controls the printer to 2.0 without updating your application to take advantage of the printer drivers, placing this statement somewhere near the beginning of your code should make things work as they did before.

If you need to save and restore the printer driver setting, you can do so using code like

```
coldPd = SET("PDSETUP")
SET PDSETUP TO
<<< do some work >>>
SET PDSETUP TO coldPd
```

This saves the name of the existing driver, turns the driver off, does some work, and then restores the original printer driver. FoxPro maintains a system variable called _PDSETUP that always contains the name of the current printer driver. If you prefer, you can bypass the command approach and make assignments to this variable directly. For example,

```
oldPd = _PDSETUP
_PDSETUP = "
<< do some work >>
_PDSETUP = oldPd
```

also saves the name of the existing driver, turns the driver off, does some work, and then restores the original printer driver. □

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Changing Dialog Box Titles: Modify the names of TPW's file dialogs. **Modifying a Data File:** QuickBASIC routines for changing record structures.

EDITED BY SHARON TERDEMAN

Changing Dialog Box Titles

Dialogs for file manipulation (such as Open, Close, and so forth) in Windows can sometimes be tricky to implement in code. For this reason, Borland included two such dialogs (called TFileDialog) in the Object Windows Library (OWL) with Turbo Pascal for Windows. These dialogs are descendant objects of TDialog. One of them, sd_FileOpen, is used for opening files and the other, sd_FileSave, is used for saving files. The

primary difference is that the sd_FileOpen dialog includes a list box containing filenames as well as a list box for directories, while sd_FileSave only contains the directory list box.

You could use these dialogs for other functions as well, but there is no provision in OWL for changing the title. Imagine the confusion if a user selected "Create a New File" and got a dialog titled "File Save".

Rather than programming a new dialog and resource, why not create a de-

scendant of TFileDialog? You need only a few lines of code, and you can retile the sd_FileSave resource to whatever you'd like. Just override the Init Constructor with a new version that adds an ACaption parameter. In the Constructor, after calling the inherited Constructor, insert this line:

```
StrCopy(Caption, ACaption);
```

You can now call the dialog just as you did before, but with any title you choose.

FILEDLG.PAS

Complete Listing

```
PROGRAM FileDlg;
USES WinTypes, WinProcs, WObjects, Strings, StdDigs;
($R FileDlg)
CONST
  AppName : PChar = 'FileDlg';
  NewOpen : PChar = 'Now, Like, Open A File, Man!';
  NewSave : PChar = 'Save My File, Please!';
  Cm_1 = 101;
  Cm_2 = 102;
  Cm_3 = 103;
  Cm_4 = 104;
TYPE
  TMyApplication = object(TApplication)
    PROCEDURE InitMainWindow; virtual;
  END;

  PTestWindow = ^TTestWindow;
  TTestWindow = OBJECT(TWindow)
    B : ARRAY[0..144] OF Char;
    CONSTRUCTOR Init(AParent : PWindowsObject; AName : PChar);
    PROCEDURE Cmd1(VAR Msg : TMessage); Virtual cm_First + Cm_1;
    PROCEDURE Cmd2(VAR Msg : TMessage); Virtual cm_First + Cm_2;
    PROCEDURE Cmd3(VAR Msg : TMessage); Virtual cm_First + Cm_3;
    PROCEDURE Cmd4(VAR Msg : TMessage); Virtual cm_First + Cm_4;
  END;

  PNuFileDialog = ^TNuFileDialog;
  TNuFileDialog = OBJECT(TFileDialog)
    CONSTRUCTOR Init(AParent: PWindowsObject; AName, AFilePath,
      ACaption : PChar);
  END;

  {-----}
  { TNuFileDialog's methods }
  {-----}
  CONSTRUCTOR TNuFileDialog.Init(AParent: PWindowsObject;
    AName, AFilePath, ACaption : PChar);
  BEGIN
    TFileDialog.Init(AParent, AName, AFilePath);
    Caption := ACaption;
  END;

  {-----}
  { TTestWindow's methods }
  {-----}
  CONSTRUCTOR TTestWindow.Init(AParent : PWindowsObject;
    AName : PChar);
  VAR H : hMenu;
```

```

  BEGIN
    TWindow.Init(AParent, AName);
    Attr.Menu := LoadMenu(hInstance, AppName);
    StrCopy(B, '*.*');
  END;

  PROCEDURE TTestWindow.Cmd1(VAR Msg : TMessage);
  BEGIN
    Application^.ExecDialog(New(PFileDialog,
      Init(@Self, PChar(sd_FileOpen), B)));
  END;

  PROCEDURE TTestWindow.Cmd2(VAR Msg : TMessage);
  BEGIN
    Application^.ExecDialog(New(PFileDialog,
      Init(@Self, PChar(sd_FileSave), B)));
  END;

  PROCEDURE TTestWindow.Cmd3(VAR Msg : TMessage);
  BEGIN
    Application^.ExecDialog(New(PNuFileDialog,
      Init(@Self, PChar(sd_FileOpen), B, NewOpen)));
  END;

  PROCEDURE TTestWindow.Cmd4(VAR Msg : TMessage);
  BEGIN
    Application^.ExecDialog(New(PNuFileDialog,
      Init(@Self, PChar(sd_FileSave), B, NewSave)));
  END;

  {-----}
  { TMyApplication's method implementations: }
  {-----}
  PROCEDURE TMyApplication.InitMainWindow;
  BEGIN
    MainWindow := New(PTestWindow, Init(nil, AppName));
  END;

  {-----}
  { Main program: }
  {-----}
  VAR MyApp: TMyApplication;
  BEGIN
    MyApp.Init(AppName);
    MyApp.Run;
    MyApp.Done;
  END.
```

Figure 1: By creating a descendant of the OWL object TFileDialog, you can gain control of the file dialog box's caption.

FILEDLG.RC

Complete Listing

```

filedlg MENU
BEGIN
  POPUP "&File"
  BEGIN
    MENUITEM "E&xit", 24340
  END
  POPUP "&Samples"
  BEGIN
    MENUITEM "Regular Open Dialog", 101
    MENUITEM "Regular Save Dialog", 102
    MENUITEM "Renamed Open Dialog", 103
    MENUITEM "Renamed Save Dialog", 104
  END
END

```

Figure 2: This resource script defines the menu for the FILEDLG.PAS example program.

For example

```

Application->ExecDialog(New
(pNuFileDialog, Init(@Self,
pChar(sd_FileSave), pFileName,
'NewFile')));

```

With this call, the dialog will appear with "New File" as the caption. The New File function here is associated with sd_FileSave—no list box is needed for filenames since you're not selecting an existing file. For a File Delete function, you would want to associate the dialog

with sd_FileOpen, because you would need to select the file to delete as well as the directory that the particular file resides in.

*Albert Howard
Hanford, California*

► **PC MAGAZINE** Indeed, the TFileDialog object is more useful when you can govern just what title the dialog box will have. It's possible to control the title by initializing the dialog, setting its Caption field to point to the desired string, and then executing the dialog. But in Object Windows Library programs it's more elegant to create and execute the dialog box in a single statement. By defining a TFileDialog descendant with the desired behavior, we are able to retain that elegance.

I've written the small program (shown in Figure 1) in order to show how you might use this to create TFileDialogs with whatever name you choose. The program relies on the resource script file shown in Figure 2 for its menu. (Note that these files can be downloaded from PC MagNet archived as FILEDLG.ZIP.) The file dialog boxes invoked by this program don't actually *do* anything, but you can see the difference in their titles!

—Neil J. Rubenking

Modifying A Data File

BASIC offers different ways to structure records in a random-access data file. The more recent TYPE structure has joined the older FIELD statement in providing two easy alternatives.

Both the TYPE and FIELD statements (as they are normally used) share a common limitation, however: The record structure they define is fixed within the application. This means that, while you can define any kind of record you want when writing the program, you can't easily create or change the record structure within a running application. Modifying the record structure is often necessary in order to add or delete fields in an existing database, and any application that lets users design their own databases certainly needs the ability to structure records on the fly.

RANDFILE.BAS is listed in Figure 3. You can download RANDFILE from PC MagNet listed as RANDI.BAS. It contains the OpenFile subprogram, which shows how a QuickBASIC program can generate user-designed random-access data structures using a lesser-known variant of the FIELD statement. Record fields are handled as string arrays—FldData\$() in the OpenFile subroutine—

RANDFILE.BAS

1 of 2

```

DEFINT A-Z

DECLARE SUB OpenFile (FileName$, FldData$( ), FieldType( ), FileNumber)
DECLARE SUB GetData (FldData$( ), FldText$( ), FieldType( ), FileNum, RecNumber)
DECLARE SUB PutData (FldData$( ), FldText$( ), FieldType( ), FileNum, RecNumber)

'These constants are not used, and are here only to show the type codes.
CONST IntType = -2          'integer
CONST LongType = -3         'long integer
CONST SingleType = -4       'single precision
CONST CurrencyType = -7     'BASIC PDS Currency
CONST DoubleType = -8       'double precision
                             'all positive numbers are string lengths

REDIM FieldArray$(1 TO 10)  'this holds the actual record data
REDIM FieldName$(1 TO 10)   'this is for prompting the user only
REDIM DataType$(1 TO 10)    'this holds each field's data type

FOR X = 1 TO 10
  READ FieldName$(X)        'read the field names for prompting
  READ DataType$(X)         'and the type of data each field is to hold
NEXT

DATA CustNumber, -2         'this is an integer field
DATA FirstName, 15          'these are all string fields
DATA LastName, 15           ' (colons are needed to comment DATA lines)
DATA Company, 32
DATA Address, 32
DATA City, 15
DATA State, 2
DATA Zip, 9
DATA LastAmount, -8         'this is a double precision field
DATA LastTax, -4            'this is a single precision field

FOR X = 1 TO 10
  PRINT FieldName$(X); ": "; 'enter the data for a record
                             'print a prompt

```

```

LINE INPUT Text$(X)        'then accept the field data as plain text
NEXT

FileName$ = "TESTFILE.DAT"  'the name of our test file
FileNum = FREEFILE          'get next available number and open the file
CALL OpenFile(FileName$, FieldArray$( ), DataType$( ), FileNum)

RecordNum = 1               'write the data in Text$( ) to record 1
CALL PutData(FieldArray$( ), Text$( ), DataType$( ), FileNum, RecordNum)
CLOSE #FileNum              'close the file to prove this is working

FileNum = FREEFILE          'open the file again and read the data
CALL OpenFile(FileName$, FieldArray$( ), DataType$( ), FileNum)
CALL GetData(FieldArray$( ), Text$( ), DataType$( ), FileNum, RecordNum)

PRINT : PRINT               'kick out a couple of blank lines
FOR X = 1 TO 10
  PRINT FieldName$(X); ": "; 'print the data for a record
  PRINT Text$(X)            'print the field name
                             'then print the field data as text
NEXT

SUB GetData (FldData$( ), FldText$( ), FieldType( ), FileNumber, RecNumber) STATIC

GET #FileNumber, RecNumber  'first read the record from disk

FOR X = 1 TO UBOUND(FldData$( ))
  SELECT CASE FldType(X)    'process all of the fields -
                             'based on their data type
    CASE -2                 'integer
      FldText$(X) = STR$(CVAL(FldData$(X)))
    CASE -3                 'long integer
      FldText$(X) = STR$(CVL(FldData$(X)))
    CASE -4                 'single precision
      FldText$(X) = STR$(CVS(FldData$(X)))
    CASE -7                 'BASIC PDS Currency
      FldText$(X) = STR$(CVC(FldData$(X)))
    CASE -8                 'double precision
      FldText$(X) = STR$(CVD(FldData$(X)))

```



Figure 3: This collection of subprograms lets you open, write, and read any type of random access data file without knowing the record structure when the program is written.

RANDFILE.BAS

2 of 2

```

CASE ELSE 'string
  FldText$(X) = RTRIM$(FldData$(X)) 'trim trailing blanks
END SELECT
NEXT
END SUB

SUB OpenFile (FileName$, FldData$(), FldType(), FileNumber) STATIC
  Reclength = 0 'build the record length
  TotalFields = UBOUND(FldData$) 'and number of fields

  FOR X = 1 TO TotalFields 'go through once to get the length
    Reclength = Reclength + ABS(FldType(X))
  NEXT

  OPEN FileName$ FOR RANDOM AS #FileNumber LEN = Reclength

  Reclength = 0 'build the record structure
  FOR X = 1 TO TotalFields
    ThisLength = ABS(FldType(X)) 'get the field length
    IF FldType(X) = -3 THEN ThisLength = 4 'special test for long integers
    IF FldType(X) = -7 THEN ThisLength = 8 'special test for Currency data
    FIELD #FileNumber, Reclength AS Dummy$, ThisLength AS FldData$(X)
  . Reclength = Reclength + ThisLength

```

```

NEXT
END SUB

SUB PutData (FldData$(), FldText$(), FldType(), FileNumber, RecNumber) STATIC
  FOR X = 1 TO UBOUND(FldData$) 'process all of the fields
    SELECT CASE FldType(X) 'based on their data type
      CASE -2 'integer
        LSET FldData$(X) = MKI$(VAL(FldText$(X)))
      CASE -3 'long integer
        LSET FldData$(X) = MKL$(VAL(FldText$(X)))
      CASE -4 'single precision
        LSET FldData$(X) = MKS$(VAL(FldText$(X)))
      CASE -7 'BASIC PDS Currency
        LSET FldData$(X) = MKC$(VAL(FldText$(X)))
      CASE -8 'double precision
        LSET FldData$(X) = MKD$(VAL(FldText$(X)))
      CASE ELSE 'string
        LSET FldData$(X) = FldText$(X)
    END SELECT
  NEXT

  PUT #FileNumber, RecNumber 'finally, write the record to disk
END SUB

```

in which each array element represents a field in the record. In this particular example, the `FldType()` array defines the structure of the record, using integer elements to describe the length and type of the corresponding `FldData$()` string elements. Using `Dummy$`, the `FIELD` statement is able to build and rebuild the record structure based on the values contained in `FldType()`.

Note that the total length of all elements in `FldData$()` must first be summed so the random file can be properly opened before the `FIELD` statement is used. Also, it's important to remember you can only use the `LSET` or `RSET` commands when assigning elements in `FldData$()`.

Of course, records must frequently have data types other than strings. The application therefore needs to know when to use `CVI`, `MKD$`, and the other conversion functions to change the elements in `FldData$()` to and from other data types. I've handled this by maintaining a parallel array, `FldType()`, that is used in the `GetData` and `PutData` procedures. This array specifies the type of data and its length, using a special set of codes. The `FldType()` array is defined when the database structure is either created or modified, and it can be saved

and loaded along with its corresponding database.

Glenn Parkinson
Severna Park, Maryland

► **PC MAGAZINE** When Microsoft introduced QuickBASIC 4.0 in 1986, they decreed that the new `TYPE` variable was intended to replace the `FIELD` statement and that `FIELD` was obsolete. But as Dr. Parkinson so aptly shows, `TYPE` is useful

only when the record structure is known at the time the program is written. It is impossible to write, say, a dBASE work-alike, or indeed any other database program where the user defines the record structure. Although it is possible to simulate the `FIELD`

statement with BASIC's powerful string manipulation facilities, using `FIELD` is much more convenient, as evidenced here.

I made several enhancements to Mr. Parkinson's original program. As submitted, routines were given to open and modify a record only. I made the routines much more general, and I also devised a method to combine the field lengths and data types into a single numeric value.

In the example portion of Figure 3, the `DATA` statements define the name and

type of each field. In practice, this information would likely be stored in a separate file. Positive field type values indicate a string field; negative values hold the length of a corresponding numeric data type.

Note in `OpenFile` the special "patch" that is needed to check for a field type of -3 and change the length to 4. Since long integer and single precision variables are both 4 bytes long, this is needed to set the correct field length for long integers. You'd need a similar fudge to accommodate the Currency data type available in BASIC 7 PDS (Professional Development System).

Note also that in the `GetData` and `PutData` routines, the code that handles Currency data is commented out, so the program can be compiled using QuickBASIC. If you are using BASIC PDS and want to handle Currency data, just remove the apostrophe that begins this statement in each procedure.

—Ethan Winer □

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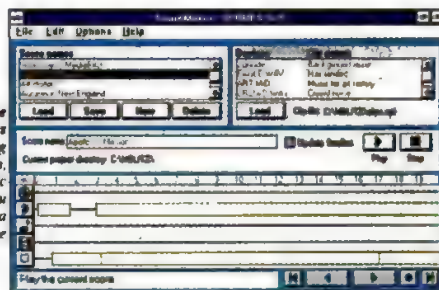
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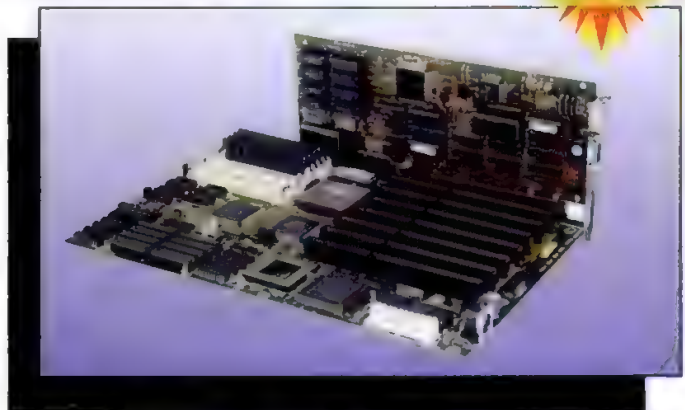
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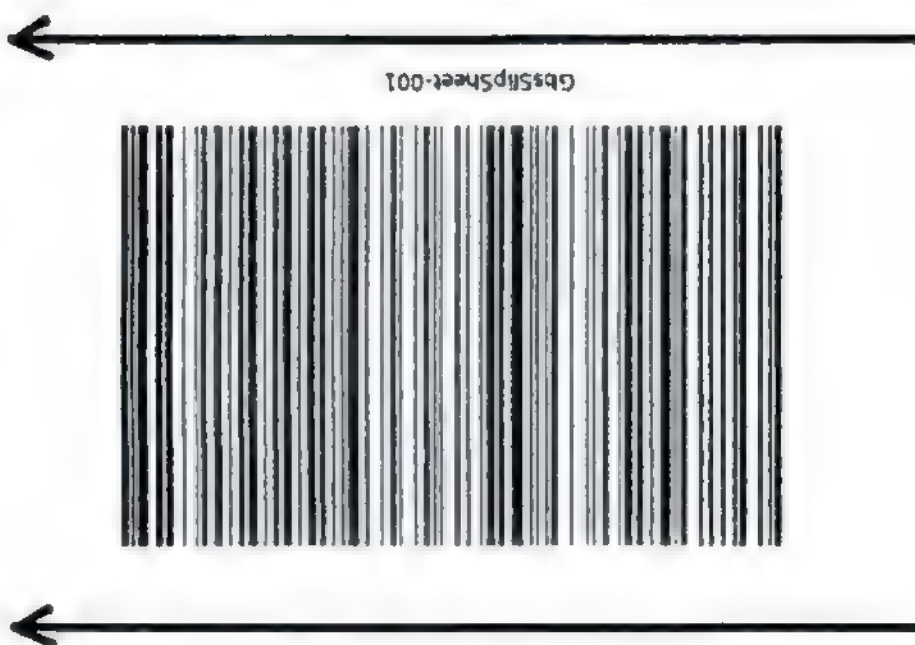


Inverted Back

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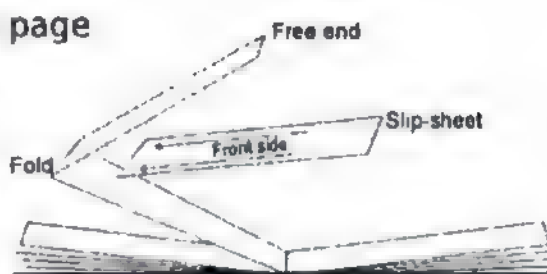
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- A diagram illustrating a slip-sheet fold. It shows a fold in a rock layer, with a 'Free end' and a 'Slip-sheet' indicated. The fold is labeled 'Fold'.

Foldout slip-sheet



Inverted Foldout slip-sheet

1. Open the foldout page
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 1. Front side touching the free page
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3. Slice the folded edge
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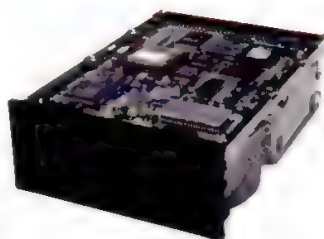
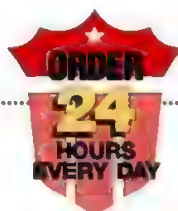
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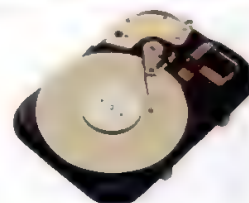
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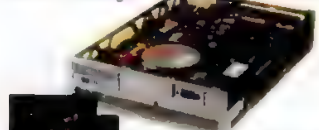
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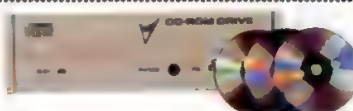
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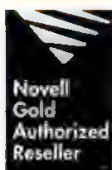


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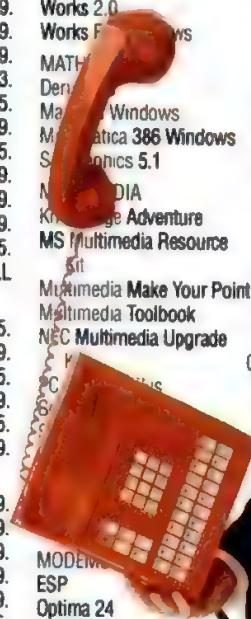
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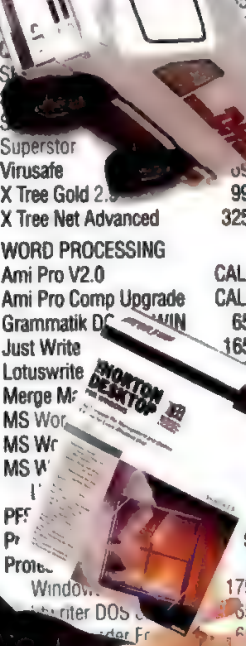
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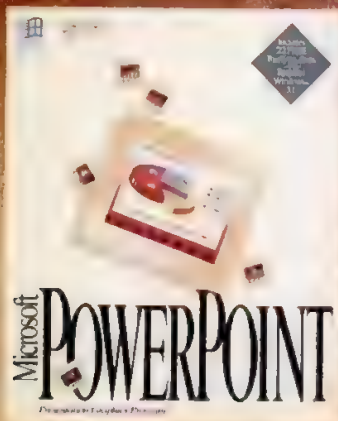


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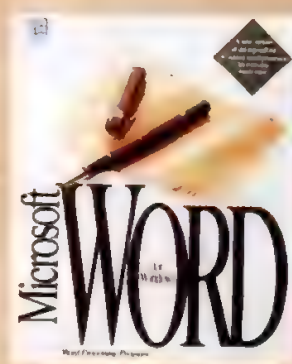
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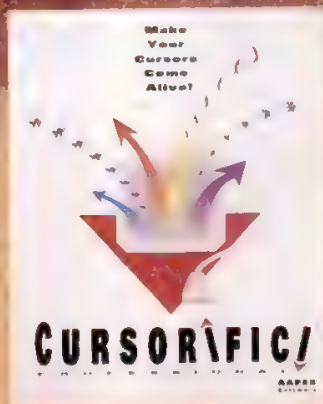
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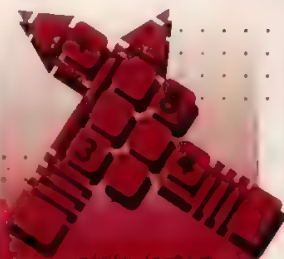
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PostScript on a LaserJet: What you need to use PostScript on an HP printer. Legal Software: Have you purchased an illegal copy of DOS?

BY JOE SALEMI

PostScript on a LaserJet

I'd like to use the Adobe PostScript language with my Hewlett-Packard LaserJet II Plus. Is this possible? If so, what modifications do I need to make?

*Sigurdur Haraldsson
Bakersfield, California*

► **PC MAGAZINE** Yes, it's possible. All you need to do is add some memory to your printer and purchase a cartridge that contains a PostScript interpreter. You'll need the extra memory because LaserJet II Plus printers come with only 512K on-board RAM and most PostScript cartridges require at least 1.5MB.

There are many cartridges to choose from, but be aware that once you make the PostScript cartridge the primary font source, all your files will be printed with PostScript until you remove the cartridge. The ability to switch between PostScript and the Hewlett-Packard Page Control Language (PCL)—from within an application—didn't come along until the release of the HP LaserJet III.

Hewlett-Packard (3000 Hanover St., Palo Alto, CA 94304; 800-752-0900, 415-857-1501) sells two PostScript cartridges. The PostScript Cartridge (\$495) offers the 35 Adobe Type 1 base fonts that are standard in most PostScript printers. The PostScript Cartridge Plus (\$695) supports PostScript Level 2 (the latest version), and it also lets you switch between PostScript and PCL 5 on the LaserJet III class of printers using software commands.

Pacific Data Products (9125 Rehco Rd., San Diego, CA 92121; 619-552-0880) is a well-known maker of accessories for HP printers, including cartridges and memory modules. PacificPage II is a combination PostScript cartridge and 2MB

printer memory module for LaserJet Series II printers that sells for \$499. The cartridge includes 35 Bitstream fonts, which are equivalent to those in the PostScript Cartridge. The PacificPage PE 4.1 (\$579) is a combination PostScript cartridge and 2MB memory kit designed to support the LaserJet IIP, IIP Plus, and Series III printers. Pacific Data cartridges do come with a DOS command-line utility that lets you switch between PCL and PostScript on any HP printer; however, they don't let you switch from within an application.

Printing in PostScript is notoriously slow; it can double the time it takes to print your work. To get around this, Pacific Data also sells cartridges with a combination memory and accelerator board based on the Intel 960 RISC chip. Such boards are designed for situations where high-speed printing is required, as when a number of users share a printer on a LAN or printer-sharing device. The PacificPage II with I960 comes with 4MB of RAM and the Intel 960 board, and it sells for \$999. The PacificPage PE 4.1 with I960 comes with 2MB of RAM and the I960 board, and sells for \$899.

Adobe Systems Inc. (P.O. Box 7900, 1585 Charleston Rd., Mountain View, CA 94039-7900; 800-833-6687, 415-961-4400), the maker of the PostScript language, sells the Adobe PostScript Cartridge (\$495) that works with the Laser-

Jet II and later models. It comes with the 35 base fonts and also supports downloaded PostScript fonts. At least 1.5MB of RAM on the printer is recommended, but is not provided with the cartridge.

Finally, there are two cartridges from Computer Peripherals Inc. (667 Rancho Conejo Blvd., Newbury Park, CA 91320; 800-854-7600, 805-499-5751). The JetPage II (\$349), for the LaserJet II and up, includes the standard 35 base fonts. The JetPage III also sells for \$349 and is compatible with the LaserJet IID, IIP, IIP Plus, and Series III printers. Again, at least 1.5MB of RAM is recommended but not provided.

The bottom line is: If you already have additional memory in your HP LaserJet IIPlus, all you'll need is one of these PostScript cartridges. If you need the additional memory board, one of the Pacific Data cartridge/memory combinations is your best choice.

Legal Software

I recently bought a 486 system at a computer expo. The manufacturer's sales representative assured me that his corporation was duly licensed to sell these computers with various operating systems, and that when I purchased the equipment, the software was legally mine. But I received no floppy disks or documentation other than what was installed on the hard disk. Do I own my copy of the operating system? Do computer manufacturers, when licensed, have the right to sell such software?

*Howard K. Barnes
Staten Island, New York*

► **PC MAGAZINE** The simple answer is that you do own a copy of the software, but

► IN THIS SECTION

Tutor 431
User-to-User 441
Spreadsheets 451
Connectivity 453
The Working Word 463
PC MagNet 473

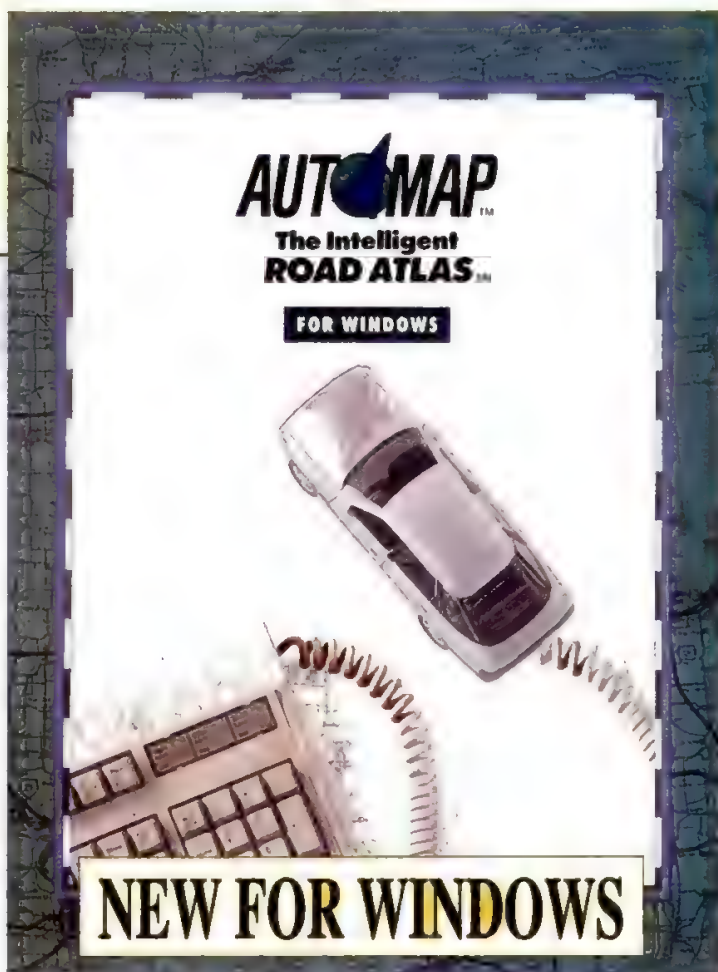
Windows *on the* Road

\$53

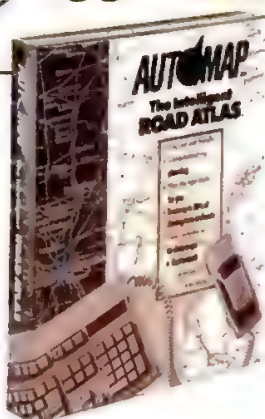
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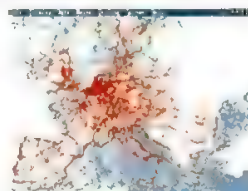
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the real question is, do you own it legally? I'm afraid that the answer is most likely no. Unfortunately, this is a common problem with computers purchased "off the table" at computer expos and fairs.

According to representatives I spoke with, Microsoft licenses both DOS and Windows to the computer vendors (known as original equipment manufacturers or OEMs) with the contractual obligation that each computer will ship with the original floppy disks and a complete set of manuals. If you don't get them, the odds are that the vendor is cutting corners and putting DOS (and possibly Windows) on the machines without paying the proper licensing fees to Microsoft.

IBM hands out electronic copies of OS/2 2.0 to its in-house staff and to certain large customers, but the disks come directly from an IBM field or service engineer. As of this writing, only a few OEMs have signed up to include OS/2 with their systems, and not one of them did so before the release of OS/2 2.0 in April.

In an effort to cut costs, application programs are sometimes handled a little differently. A number of OEMs bundle applications with their systems by installing them on the hard disks and sending only the manuals. If you want copies of the original floppy disks, you can order them for a small fee of about \$20.

In any case, all systems are supposed to be sold with official copies of the documentation for the operating systems and software, as documentation or floppy disks are the only proof of legal ownership available. Since you didn't receive any documentation, you can pretty much assume you've been the victim of software piracy committed by the vendor. If you have the vendor's name or number, call and request the proper documentation and disks for your software. If the vendor doesn't provide them, your next recourse is to contact both the local Better Business Bureau and the software vendor to make a complaint against the company.

If you can't contact the OEM, or if it won't provide the documentation and floppy disks, your only solution is to purchase legal copies. If you have some version of MS-DOS, the official upgrade package to Microsoft DOS 5.0 lists for \$99 (Microsoft Corp., One Microsoft

Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080). Many computer stores and mail-order vendors sell it at a discount, so you can sometimes get a copy for as little as \$50. Or you can purchase a copy of Digital Research's DR DOS 6.0 (Novell, 121 East 1700 South, Provo, UT 85606; 800-638-9273, 408-649-3896), a \$99 DOS-compatible operating system that was reviewed in our issue of November 12, 1991. If you have Microsoft Windows 3.0 or 3.1 on your hard disk, the official price is \$149, but again, many vendors sell the package for around \$50. IBM's OS/2 (IBM, Armonk, NY 10504; 800-426-2468, 914-765-1900) retails for \$199 and is discounted to around \$100 by most retail vendors.

PC Magazine Index

Your magazine contains a wealth of information, but it's hard to access because of the number of pages per issue and issues per year. I have all your back issues on my book shelves, but it takes too long to review all of them when I'm looking for a particular bit of information. Is an index available on floppy disk to help me search for a particular topic?

Mark E. Bresse
Newport, Washington

► **PC MAGAZINE** *PC Magazine* has an electronic index available for downloading on PC MagNet (see page 12 of this issue for access instructions). The search engine is available in Library 1 (General Info) of the Utilities/Tips Forum as PCSRCH.EXE, a self-extracting archive that contains the Computer Library software. Separate self-extracting archives contain the actual database files: PCM91A.EXE contains the information for the first 11 issues of 1991, and PCM91.EXE, PCM90.EXE, PCM89.EXE, and PCM88.EXE contain the data for 1991, 1990, 1989, and 1988, respectively. There's also a self-extracting archive (PCM.EXE) that contains the data from all these years, but it's over 1MB in size, so you might want to download just the years you want.

The search software lets you query the indexes on a number of words or phrases, and you can use Boolean operators (such as AND, OR, and WITHIN) or wildcards as part of a search.

The software displays short citations, each containing the name of an article, the issue number and date, and the page number. Highlight the citation and hit Enter to view an abstract, which includes a description of the article, the author's name, and the companies and products mentioned. You can print the information or copy it to a text file.

In case you don't need to have the index available all the time, you can also access the reviews database through ZiffNet (the parent system of PC MagNet). Once you're on-line, type GO REVIEWS and search for past *PC Magazine* articles there. The on-line reviews database also includes information on articles from other Ziff-Davis publications such as *PC/Computing* and *PC Week*.

If you have a CD-ROM you can subscribe to Computer Select, a service that provides monthly CDs containing the full text of articles from over 140 computer-related publications, information on all the hardware and software products and companies reviewed, and a dictionary of computer terms. The service costs \$999 per year and uses the same search engine used on PC MagNet. Computer Select is available from Computer Library, 5th Floor, One Park Ave., New York, NY 10016. Call 800-827-7889 (ext. 102) or 212-503-4400 for more information and a demo disk.

If you don't have a CD-ROM system or you want only occasional access to the information contained in Computer Select, you can access the databases it contains through the COMPUTER DIRECTORY (COMPDIR) and COMPUTER DATABASE PLUS (COMPDB) services on ZiffNet. Each service carries a small surcharge (\$15 per hour, plus a charge for full-text articles or company and product information), but searches are very fast and generally don't cost more than \$2 to \$3. □

ASK THE ADVISOR

Send your questions to Advisor, *PC Magazine*, One Park Ave., New York, NY 10016. Or you can send it via e-mail to our MCI mailbox (PC Magazine) or, on CompuServe, to 72241,104. We regret that we are unable to acknowledge submissions or answer letters individually.

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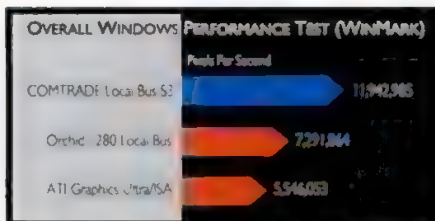
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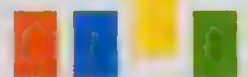
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At FastMicro, we've been building PCs for over six years, in fact, we've been doing it since the day we went into business. So when we sat down to design our most powerful FastData PCs ever, we wanted them to stand apart from the crowd. We utilized the most advanced technology available and combined it with the features our customers asked for most and came out with a whole new line of 386 & 486 PCs that are as different from our previous products almost as much as they are from our competitors' boxes.

Our new desktop case has extra RF shielding, lots of drive bays (notice the seventh bay under the power supply), dual cooling fans and a stylish pop-off front cover.

Advanced Case Design

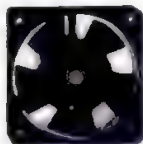
Our new desktop case is uniquely engineered to provide the highest quality and maximum expandability in a space saving design. *It has a total of seven drive bays to accommodate all of the storage options our customers tell us they want to be able to add in the future.* It also has extra protection against electrical interference, unlike the weaker systems others sell.



You won't run out of room when adding new peripherals!

Dual Intelligent Cooling Fans

Intel's new clock doubler chips put out much more heat than its predecessors. Some Overdrive processors even require a heat sink. FastMicro's new desktop PCs come with a second temperature activated fan to dissipate system damaging heat. Not all systems are alike, *FastMicro's last longer!*



FastMicro puts a second fan up front, where the heat is!

The Most Processor Upgradability - All the Way to 100MHz

We've designed our new systems to expand upon Intel's ambitious upgrade strategy. While some other systems have no upgrade path and others only let you upgrade from 386DX to 386DX,

i486SX to i486SX or i486DX to i486DX (or DX/2),

FastMicro's new systems can be upgraded to any 486 processor - 486SX or 486DX. So the 486SX you get today can be upgraded to a 486DX or DX/2 tomorrow.

Imagine buying a FastData 486DX/33 now and upgrading it to a 100mhz DX/2 later - our systems are designed to do just that. You can go up to a 50mhz clock rate processor (100 mhz for clock doublers).

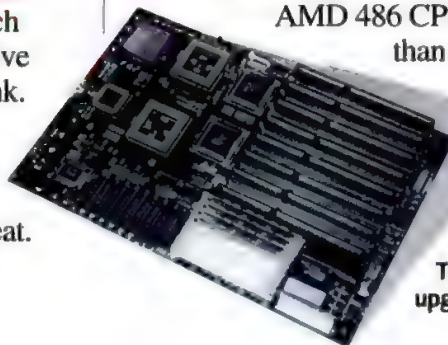
Plus, unlike some other companies that make you purchase an expensive proprietary "CPU Module" or "Upgrade Card" not available anywhere else, all you have to do to upgrade your FastData 486 is to install a new processor, replace the clock crystal and change some system settings. That's it - no catches.

Upgradable 386/40 Too!

The FastData 386-40 is the most upgradable PC on the market! Not only do you get the most power for your money today, but you can upgrade your system to current and future 486 processors. All you do to upgrade is plug in a new processor & a crystal. Processors & crystals are widely available. You can install i486DX, i486DX/2, i486SX, & announced AMD 486 CPUs. That's more flexibility than other companies' computers.

FastMicro really maximizes value today and protects your investment tomorrow!

The FastData 386/40 is easily upgradable to 486 processors!



FastMicro protects your investment.

Turbocharge Windows with 486 Local Bus Video Power!

FastMicro's new systems feature the highest performance video options on the market today. From our standard 1mb Super VGA adapter to our highest performance Windows accelerator card - every video option we offer consistently yields the highest possible performance at the lowest possible cost.

Today's Windows environment is very dependent on video speed for overall system performance. The i486 is a high speed 32 bit processor, it handles data in and out in 32 bit chunks at external processor speed (such as 33mhz). The problem is that the ISA bus found in normal systems is 16 bit and only runs at 8 mhz, thus video performance is severely crippled!



FastMicro includes a Non-Interlaced 1024x768 Super VGA monitor.

FastMicro removes the performance limit with its 32 bit high speed local bus. Plug the Local Bus Video Card into the special 32 Bit Slot and Windows flies!

Powerful 170 Mb IDE Hard Drive.

FastMicro includes Conner's CP-30174 170mb IDE hard drive standard in the FastData 386/40. Conner has a reputation for building the most reliable drives on the market, in fact, the CP-30174 has a MTBF

(mean time between

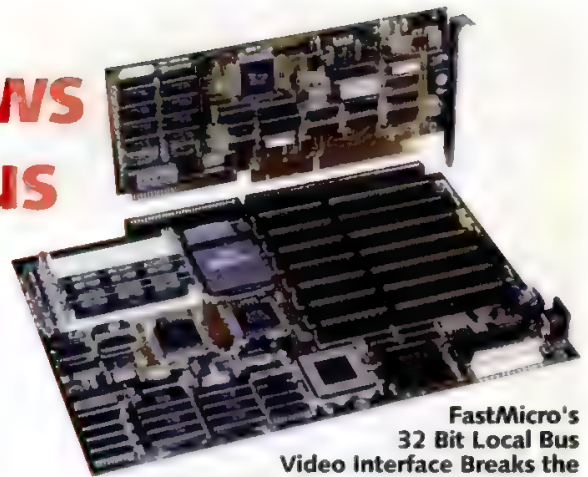
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failures) rating of more than 150,000 operating hours. If you ran your

FastData system 24 hours a day - that's more than 17 years!

Couple this with a <17 millisecond access time and 32K built-in cache and you won't want to gamble on a less reputable drive.

Why run out of storage with an average 120mb drive? FastMicro gives you the 50mb bonus.

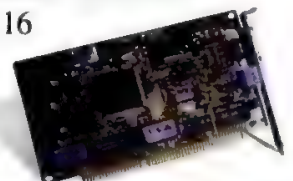


FastMicro's 32 Bit Local Bus Video Interface Breaks the 16 Bit Bottleneck into Little Pieces.

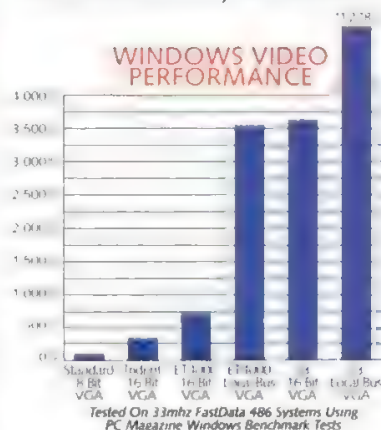
The Highest Performance Video Options

FastMicro lets you choose from several different video cards and monitors to suit your individual application.

Some systems come standard with our Trident 1mb VGA card: it's 16 bit, runs Windows 3 times faster than standard 8 bit video cards and does up to 1024 x 768 at 256 colors. Other systems come standard with our PowerWin™ Hi-Color ISA card. It uses a Tseng Labs ET4000 Windows Accelerator Chip, it's more than twice as fast as the Trident card and it does a maximum of 32,768 colors. Our S3 NuclearWin™



FastMicro's ISA PowerWin VGA is over seven times faster than standard VGA!



Coprocessor ISA Video Card offloads the video processing from the CPU and, in turn, significantly multiplies performance. It's like having a second computer in your computer!

Choose one of our Local Bus 486

PCs and we'll include the Local Bus Version of our PowerWin Accelerator - it screams through Windows graphics. You can also upgrade to the Local Bus Version of the NuclearWin Card - it will run Windows up to 100 times faster than standard VGA Cards. *Fasten your seat belts!*

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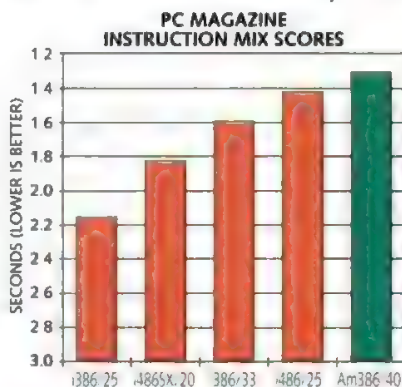
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- Fast/Micro Peace of Mind.



Want the fastest 386?

Why settle for anything slower, the 40 mhz Am386DXL from Advanced Micro Devices is the fastest 386 chip on the market, hands down. Not only does it outperform all other 386 chips, it even outperforms many 486 processors too. When looking for a 386 or 486 PC, look for the Am386DXL-40; it's over 20% faster than 33mhz 386 processors, over 31% faster than the Cx486SLC-25, over 50% faster than the i486SX-20, and over 13% faster than the i486SX-25 (in MIPS as tested by Power Meter vers. 1.5). The data speaks for itself - don't pay more and get less.



According to a Jan. 14 1992 PC Magazine Review, the Am386/40 was faster than all other 386 processors, it was even faster than most available 486 processors!

More Power Per Dollar.

Not only is the Am386DXL-40 faster than the i486-25, it's a better value too! The AMD chip costs a lot less than the price of the 486SX and FastMicro passes the savings and performance gain on to you. Plus, there is no sacrifice in upgradability!

Certified Compatible - of Course.

The Am386 processor family is certified compatible with all 386 compatible hardware and software. It has flawlessly passed tests from every top computer publication and has been tested in over 100 different 386 systems (including FastMicro's) and passed all tests without a single failure or incompatibility. Its compatibility has even been certified by XXCAL Testing Labs.



Look under the hood.



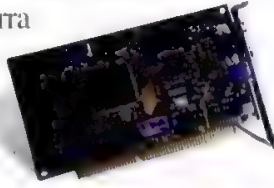
The AMD processor is easy to spot. Just look for the logo to the left. It's the only way to get the fastest 386 performance at the price of an ordinary 386 PC.

The Fastest 386SX Too!

The latest high performance 386 processor from Advanced Micro Devices is the Am386SXL-33. It's 32% faster than 25mhz 386SXs and combined with FastMicro's 16K optimized cache, it boosts performance to 74% above normal 386SX-25 levels.

Ultra-Fast, Ultra Clear Video

Order the FastData 386/40 and we'll include our PowerWin Windows Video Accelerator Card at no extra charge. Its Tseng Labs ET-4000 graphics accelerator runs Windows over *seven times* faster than standard VGA cards and its Sierra Ramdac Hi-color chip delivers up to 32,768 colors. We top your system off with a Non-Interlaced Super VGA monitor with resolutions to 1024 x 768 and a sparkling 72hz refresh rate. Order either of our Am386SXL models and we include the non-interlaced monitor with a 1mb Super VGA Card (its over two times faster than standard cards).



Remember, when you buy from FastMicro, you can choose from hundreds of hardware and software products to enhance your system.

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FastMicro backs up all FastData PC's with the most comprehensive service in the business. Seven day a week toll-free technical support is included for as long as you own

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Upgrade your FastData 386 system to the PC Magazine Editors' Choice Diamond Stealth VRAM and the PC Magazine Editors' Choice MAG Colorview/15 15" Super VGA Monitor for just \$399



your FastData PC. In the unlikely event a part should fail during the one year warranty, we'll express ship you the replacement part. If we still can't resolve the problem, we'll send GE on-site or replace the system at no charge.



GE Computer Service



Why buy your PC from one company and your software and peripherals from another? FastMicro supports you better with our complete inventory of all the leading computer products at low FastMicro prices.

BUYER'S CHECKLIST

	FastData 386/40	Other 386's	Other 486SX's
386 Priced	X	X	
40mhz Performance	X		
486SX Overdrive Ugr.	X		X
486DX Upgradeable	X		
486DX2 Upgradeable	X		
Cache Upgradeable	X		?
170mb Conner Drive	X		
7 Drive Bays	X		
Dual Cooling Fans	X		
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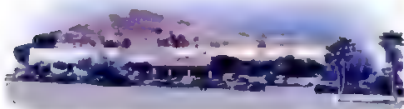


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TUTOR

GPFs In Windows: Tracking the causes of General Protection Faults. The SCSI Non-Standard: SCSI comes in several flavors. Here's what to do about it.

BY JEFF PROSISE

GPFs in Windows

I have a 16-MHz 386SX with 4MB of RAM, a 40MB hard disk, and a 1989 AMI BIOS. I tried to run Microsoft Windows 3.0 on my system, but it suffered frequent UAEs (Unrecoverable Application Errors) and lockups. I upgraded to 3.1, hoping to see improved reliability. Instead, I experience more errors than before, although now they're called General Protection Faults (GPFs).

I can rarely run more than 10 minutes without a GPF or complete lockup. Usually the problem occurs after I press a key or click a mouse button. It strikes many Windows applications, so I know no single program is at fault. The program, Dr. Watson, indicates that the errors occur in several different modules; thus the GPFs don't appear to be the result of buggy software.

What's wrong? What causes GPFs, and can I do anything about them? Unless I can solve this problem, I'm resigning Windows to the trash heap.

R. D. Kenitzer
Sequim, Washington

► **PC MAGAZINE** General Protection Faults occur when the CPU, running in protected mode, tries to access a memory location in a region that doesn't belong to it. (Windows 3.1 always uses the processor's protected mode. Version 3.0 uses it when in Standard or 386 Enhanced mode.) When this happens, the CPU notifies Windows that a program just attempted an illegal memory access. Windows responds with a GPF, which often occurs as the result of a bug in a program or driver. In this situation, Dr. Watson provides the detailed information the software's author needs to pinpoint the

location of the bug. If the GPFs are not isolated to one program, however, the problem is more insidious.

GPFs occur for many reasons and in some cases can be eliminated with simple configuration changes to Windows (or to other components of your system). Conquering other GPFs may require hardware upgrades. As noted in the Windows Resource Kit (a 538-page book-and-disk package, available separately for \$19.95),

GPFs occur for many reasons and in some cases can be eliminated with simple configuration changes to Windows.

the most common causes of GPFs besides faulty software are:

- BIOS incompatibilities. Microsoft has documented several BIOS brands and revisions that may cause problems with Windows. Among them: AMI BIOSes dated 1987, 1989, or 1991; Award BIOSes prior to Version 3.05; DTK BIOSes revisions 36 and earlier; and Phoenix BIOSes dated 1987 or earlier.
- Running an OEM version of DOS not intended for the PC on which it's being used—Compaq DOS on a Zenith PC, for example.
- Using a HIMEM.SYS release prior to 3.01. If you run Windows 3.1, you shouldn't use the HIMEM.SYS supplied with either Windows 3.0 or DOS 5.0.
- Cross-linked files on your hard disk. These can be eliminated by running CHKDSK with a /f switch. Be sure you

do so *outside* Windows; otherwise, CHKDSK could destroy valid files.

Other sources of trouble when running Windows in Enhanced mode on some PCs include:

- Windows handling hard disk controller interrupts internally rather than passing them to the BIOS. This is governed by the VirtualHdIrq statement in the [386Enh] section of SYSTEM.INI. Some PCs require that you disable VirtualHdIrq when Windows runs in Enhanced mode.
 - Windows using ROM address space in the F000h segment of memory (the final 64K of the first megabyte) for a breakpoint on a machine that contains something besides ROM in this area. The SystemROMBreakPoint statement in SYSTEM.INI controls this. Disable it if you run QEMM-386, 386MAX, or another Virtual-86-mode memory manager.
 - Windows failing to recognize regions populated by ROM or RAM when scanning the upper memory area (640K to 1MB) for unused address space. If this happens, Windows may map either an EMS page frame or translation buffers over the ROM or RAM. (The *translation buffer* is an area of RAM, typically 12K to 24K long, that Windows uses to pass data to and from real-mode DOS functions when running the CPU in protected mode.) If you can pinpoint the address where the conflict occurs, you can prevent Windows from using that address by adding an EMMExclude statement to the [386Enh] section of SYSTEM.INI.
- You can easily test for the last three conditions under Windows 3.1 without editing your SYSTEM.INI file. Start Windows by typing WIN /D:VSX—the equivalent of running with VirtualHdIrq=OFF, SystemROMBreakPoint=

FALSE, and EMMExclude=A000-EFFF in SYSTEM.INI. If the GPFs disappear, you've narrowed the problem down to one of these three settings. Experiment individually with the /D switches to determine which one resolves the problem, then add the corresponding statement to the [386Enh] section of SYSTEM.INI. For example, if Windows runs fine when started with the switch /D:V but generates GPFs without it, add the statement

```
VirtualHDIRq=FALSE
```

to SYSTEM.INI. If /D:S does the trick, then add

```
SystemROMBreakPoint=FALSE
```

If the /D:X switch eliminates the GPFs, however, more work remains. While you could simply add

```
EMMExclude=A000-EFFF
```

to SYSTEM.INI, this creates a pair of undesirable side effects. It disables expanded memory emulation, preventing Windows from providing EMS 4.0 expanded memory to PCs with only extended memory. It also forces Windows to put translation buffers into conventional memory, reducing the amount of RAM available to DOS programs.

Rather than excluding all the address space in the upper memory area, try different exclusion ranges to see exactly where the conflict occurs within this larger region. The area of conflict will usually be 32K or less, so you might arrive at a quick solution by excluding A000 to A7FF, then A800 to AFFF, and so on, until the GPFs go away. Don't stop, though, if leaving out a certain 32K block of memory works. Try halving it; excluding 16K may be sufficient. The smaller the excluded range, the larger the space Windows will have to work in.

Suppose, for example, Windows fails to recognize a network adapter that maps a RAM buffer into the 32K area from D800 to DFFF. Assuming that Windows is your primary memory manager, the statement

```
EMMExclude=D800-DFFF
```

should solve the problem. If you're using

a third-party product such as QEMM-386 or 386MAX, perform the address range exclusion on the CONFIG.SYS line that loads the memory manager rather than in SYSTEM.INI. The README.WRI file (placed in the Windows directory of your hard disk by SETUP) contains additional tips concerning Windows and third-party memory managers.

In your case, the trouble is probably your BIOS. Page 12 of the Windows Resource Kit notes that the 1989 AMI BIOS (which you mention your computer contains) "causes intermittent UAEs and system hangs." Before ordering a BIOS upgrade, though, try starting Windows with the /D:VSX switch as described above. If that doesn't eliminate the GPFs, contact the company that manufactured your PC (or AMI) to inquire about a BIOS upgrade.

There's a larger lesson here. Several factors make Windows more sensitive to hardware than DOS is. First, in Standard or Enhanced mode, Windows runs the CPU in protected mode. Many BIOSes were designed to work only in real mode, though, and what works in real mode may cause system errors in protected mode. A second factor is that Windows bypasses the BIOS and communicates with most hardware devices directly. DOS, by contrast, uses the BIOS to communicate with all devices. If you're shopping for a PC, don't blindly assume that Windows will run on it—especially in Enhanced mode. When possible, buy a machine that comes bundled with an OEM version of Windows. OEM versions have been tweaked to ensure that they run on a particular brand of PC.

If you buy a PC for which a matching OEM brand of Windows isn't available, reserve the right to return the merchandise if it suffers compatibility problems. Many PC manufacturers give you a short period of time (typically 30 days) to return a PC at no cost or for a minimal restocking fee.

The SCSI Non-Standard

I bought a Conner hard disk recently to replace the Seagate drive in my PC. Although both drives use a SCSI interface, I was told that the Conner wouldn't work with the Seagate's SCSI adapter, so I had to buy a new controller (an Always

INS2000). I don't understand this; I thought the big selling points of SCSI were interoperability between devices and the fact that you can run several SCSI devices off a single host adapter.

*Stephen Tunnell
Jersey City, New Jersey*

► **PC MAGAZINE** Interoperability between devices is a selling point for SCSI—but not all SCSI devices are created equal. To date, no standard protocol exists that allows IBM-hosted SCSI adapters to communicate with SCSI devices. In the absence of such a standard, three competing semi-standards have emerged: the Layered Device Driver Architecture (LADDR) from Microsoft, the Advanced SCSI Programming Interface (ASPI) from Adaptec, and the Common Access Method (CAM), which the American National Standards Institute is expected to approve very soon.

Unfortunately, none of the three "standards" are compatible with the others, and none are likely to go away anytime soon. Help is on the horizon, however. Corel Systems Corp. now offers a \$99 product called CorelSCSI Software Version that enables hundreds of SCSI peripherals including tape drives, Bernoulli Boxes, CD-ROM drives, and hard disks to be run with any ASPI host adapter. If your plans involve SCSI and you wish to attach several SCSI devices to a single host adapter, choose one conforming to ASPI. Then if a given peripheral or its drivers aren't directly compatible with your chosen host adapter, you may be able to make them so with a CorelSCSI driver. For more information concerning CorelSCSI or a list of devices that it supports, contact Corel Systems at 613-728-8200. □

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The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Ave., New York, NY 10016, or upload them to PC MagNet. We regret that we are unable to acknowledge submissions or answer letters individually.

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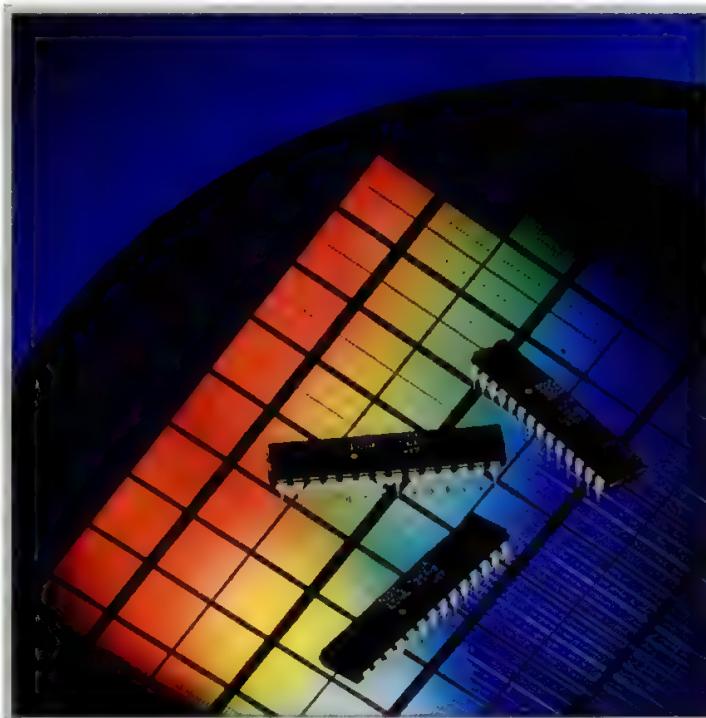


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Get a whole CD set-up at one low price. Includes NEC CDR-37 Ext CD player, a pair of amplified speakers, stereo headphones and XT/AT interface. Also includes Grolier Electronic Encyclopedia, Time Table of History, World Atlas, TIME Almanac, National Geographic Mammals, Great Cities of the World, and Battle Chess CD's.



CD-ROM Software

Artshow by Corel	49
Baseball's Greatest Hit	49
BattleChess or Carmen SanDiego	45
Beritz Think & Talk French	99
Beritz Think & Talk Spanish	99
Book of Mammals	49
Encyclopedia	69
MS Bookshelf, Stat. Pack, World Atlas & Consultant	99
MS Multimedia Beethoven	55
MS Multimedia Bookshelf	125
PC SIG Shareware CD	99
U.S. or World Atlas - MPC Vers.	85
World Atlas or U.S. Atlas	45

Video Blaster \$329

The ultimate in video versatility for multimedia computing. Integrate video from a wide range of sources - video cameras, VCRs, TV - with your PC applications. Runs within Windows and lets you combine video with text & graphics.



CD-ROM Hardware

Hitachi Ext. 680mb Kit	449
NEC Ext. CD Gallery w/CDR37	559
Pinnacle Internal CD-Rom w/Atlas	319
Pinnacle External CD-Rom w/Atlas	379
SoundBlaster Pro w/Int. CD Kit	559
Sony Int. CD Drive Kit	349
ATI Stereo F/X	129
Creative Labs	
Multimedia Kit CD-ROM & SB Pro	569
Sound Blaster	95
Sound Blaster Pro (stereo & MIDI)	179
Video Blaster	319

DRIVES

Seagate 130mb IDE Kit \$339

IDE performance, big 130 megabyte capacity, 19ms access time and 5 mbps transfer rate make this a great buy. Controller, cables and rails are included to make installation fast and easy.

Cokemac	
DJ-10 40-120mb Int. Tape	199
DJ-20 80-240mb Int. Tape	259
External Kit w/AB11	99
DTC	
6280 ESDI 16bit HD/FD Cont.	119
6280-15T 24mb/sec transfer rate	169
Maxtor	
7120A 120mb 15ms IDE	299
7213A 213mb 15ms IDE	499
Micropolis (see DTC Controllers)	
MC1664 345mb HH ESDI 14ms	899
MC1568 668mb FH ESDI 14ms	1399
MC1518 1.3gb FH ESDI 14ms	2399
Plus Development	
HardCard IXL 50mb 9ms 16bit	249
HardCard IXL 105mb 9ms 16bit	399
Quantum	
LPSS2A 52mb 9ms IDE	199
LPS120A 120mb 9ms IDE	339
LPS240A 240mb 9ms IDE	599

Teac 1.44mb 3.5" or 1.2mb 5.25" Floppy Drive	\$59
Genuine Teac quality at a low FastMicro price, these high density floppy drives also read, write & format low density floppy disks. They work great with all true 286, 386 & 486 compatibles. 1.44 mb 3.5" drive includes mounting kit and bracket. For rails for 1.2mb 5.25" drive, add \$5.	



DRIVES CONT.

Seagate	
30MB XT Kit ST238 w/ cont.	249
40MB ST351A 28ms IDE Drive	179
105MB ST3120A 19ms IDE Drive	279
125MB ST3144A 19ms IDE Drive	299
245MB ST3283A 12ms IDE Drive	549
425MB ST1480A 14ms IDE	999
1.3MB ST41600N 14ms SCSI	2299
Teac	
1.2MB 5.25" Floppy	59
1.44MB 3.5" Floppy	59
Tohiba	
360K 5.25" Floppy (Black)	59
1.2MB 5.25" Floppy	59
1.44MB 3.5" Floppy	59
Western Digital	
WDAC280 80mb IDE 20ms	259
WDAC2120 120mb IDE 20ms	299
WDAP4200 200mb IDE 20ms	479

MODEMS

ATI	
2400 ETC V.42 Int. / Ext.	75/99
9600E External MNP V.42bis	279
Everex 2400B Int. Modem	85
Hayes	
Optima 9600 Ext.	349
Optima 9600 Ext. w/ Fax	379
Ultra 144 Ext.	669
Pocket Edition 2400 Modem	119

Optima 9600 \$349

Hayes quality and affordability in this V.32 9600 bps modem. V.42bis, V.42, and MNP 5 error correction and automatic feature negotiation for the most efficient performance.

Intel	
Classic 2400 Modem Int. / Ext.	139/149
Satisfaction Int. 100/200	99/299
Practical Peripherals	
2400B Int. Modem Std/MNP	79/119
PM9600SA Int. / Ext.	279/299
PM14400FX Int. / Ext.	379/419
USRobotics	
2400 Sportster MNP Int. / Ext.	149/159
9600 Sportster Int. / Ext.	399/449
Courier HST 14,400 Int. / Ext.	539/559
Courier HST 14,400 Dual Std Ext.	799
ZOOM	
2400B Internal Modem	59
2400 V.42bis External Modem	119
9624 Send/Receive Int. Fax Modem	79

MICE & INPUT

Kurta XLP1212 \$249

Whether you're a graphics or CAD user, the XLP is easy to use. Drivers include AutoDesk ADI and Windows 3.1 support. Bundle includes 4-button cursor, pen and lifetime warranty. XLP-1212 available for \$529.

Key Tronic 101 Keyboard	59
Logitech	
Mouseman Serial nighthand	65
Mouseman Bus nighthand	65
Mouseman Cordless	85
PhotoMan	499
ScanMan 32	139
ScanMan 32 with Catchword	179
ScanMan 256 for Windows	259
Trackman 9/25	259
Microsoft	
Serial or Bus Mouse only	83
Serial or Bus with paint	95
Serial with Windows	147

NETWORKING

Artisoft/Lantastic	
Lantastic for Windows	165
Lantastic 2 Station Ethernet Kit	469
Ethernet Additional Stations	209
Engle	
NE2000 2 Station NW Lite Kit	459
NE1500 16 Bit I/ObaseT Adapter	149
FastData NE2000 16 Bit I/ObaseT	109
Intel EtherExpress 16 or 16TP	129
Novell Netware Lite 1.1 w/ DR DOS	65

VIDEO & MONITORS

ATI	
Graphics Vantage 1mb	219
VGA Basic 16 / Integra	65/79
VGA Wonder XL24 1mb	149
Graphics Ultra 8514-VGA 1mb	479
Diamond	
SpeedStar24X 16 Million Colors	179
Sleath VRAM HColor 1mb	255
Everex EGA 480 Card	69
FastData Monitors & Cards	see below
Hercules Graphic Card +	99
MAG Colorview/15	Call
Mitsubishi	
1410 EGA Monitor	259
Diamond Pro 14	399
Diamond Scan 16L	919
NEC	
Multisync 3FGX	669
Multisync 4FG	799
Multisync 5FG	1399
Orchid	
ProDesigner II 1mb	219
1410 EGA Monitor	319
Panasonic C1381 VGA1024	329
Radius Color Pivot w/ Card	1099
Seiko CM1440 /CM1450	489/569
Sony 1304 Multiscan	599

Panasonic 24 Pin KX-P2123 \$259

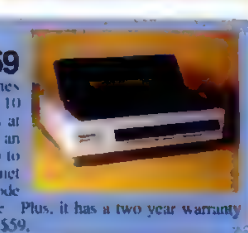
The Panasonic KX-P2123 combines high quality 24 pin printing with 10 resident fonts and color upgradability at a great FastMicro price! It includes an easy to set front panel and prints up to 240 cps in draft mode. It's very quiet with only 46.5 dBA in standard mode and 43.5 dBA in Super Quiet mode. Plus, it has a two year warranty and you can upgrade to color for just \$59.

PRINTERS CONT.

Panasonic 4410 Laser \$649

The Panasonic KX-P4410 includes 5 PPM, HP IIIP emulation, a large 300 sheet paper tray and 28 standard fonts. It works with all current major software programs, has 512K of upgradable memory, and has an EZ-set LCD panel.

Okidata	
Okidata 400	599
Panasonic	
KXP1180 9 Pin	149
KXP1123 24 Pin	199
KXP1124 High Speed 24 Pin	279
KXP1824 24 Pin Wide	399
KXP2180 Quiet 9 Pin	179
KXP2123 Quiet 24 Pin	259
KXP2124 Quiet 24 Pin	Call
KXP21XX Series Color upgrade kit	59
KXP2624 High Speed Quiet 24 Pin	399
KXP4410/4430 Laser	649/Call
KXP4450 Laser	1069
KXP4455 Laser	1699
QMS PS410	1599
Seiko Smart Label Printer Plus	139



Video 7	
WIN VGA 512K/1MB	139/169
V-RAM II Ergo VGA 1mb	319

CHIPS

Cyrix FasMath387DX	89
FasMath387SX	75
Everex	
RAM3000 16 bit - w/ OK (max 3mb)	75
RAM3000 16 bit - w/ 1mb	125
RAM8000 16 bit - w/ OK (max 8 mb)	169
RAM8000 16 bit - w/ 2mb	269
Intel	
287-DX	79
387-DX	85
387-SX	79
Overdrive Processors	Call
Memory - 1mb SIMMS 80ns	29
Memory - 1mb chips 80ns set of 8	39

PRINTERS

Canon	
BJ10EX Portable	319
BJ300 / BJ330 Ink Jet	459/599
LPB-4 Plus	899
Citizen	
200GX 9 Pin	159
GSX 130 24 Pin	249
GSX140 - 24 Pin	295
GSX145 24 Pin Wide	385
PN48 Std / Pro	299/329
Co Star LabelWriter IIPlus	179/289
Epson	
Memory Products	Call
HP II, IP, or III 1/2mb Upgrade	99/129
OKI 400 1/2mb Upgrade	129/189
Pan. 4420, 4450 1/2mb Upg.	119/169
NEC	
P3200 24 Pin	239
P3300 24 Pin Wide	339
F6200 / 6300	419/599
Colomate PS Model 40	4499
Silentwriter 2 Model 95	1444

Traveller 9624FP \$109

Ideal for portable and notebook computers, the Traveller Pocket FaxModem includes 9600/4800 bps send/receive fax and 2400bps modem with V.42 bis & MNP 2-5 for 9600bps throughput. It runs on a nine-volt battery or supplied AC adapter and includes software and modem cable too! It's built in the U.S. and has a 3 year warranty.



Star	
NX1001	139
NX2410 / 2415	189/369

Texas Instruments	
MicroLaser Plus PS17	1199
MicroLaser Plus PS35	1299
MicroLaser PS35 Turbo	1599

FASTDATA PRODUCTS

FastData Boards	
16bit 1mb VGA	69
16bit 256K VGA	45
2400B Internal Modem	49
9600B Send/Rec. Fax w/2400B	69

1mb SVGA Card \$69

Resolution up to 1024x768 & 256 Colors, 16 bit interface and Trident VGA chip make the FastData 1mb SVGA card a great buy. Its compatible with all standard compatibles & VGA/SVGA monitors.

CGA Card	35
Ethernet 16bit 10Base-T	109
IDE 16 Bit Hard/Floppy Disk Cont.	29
IDE HD/FD w/Par2 Serial/Game	39
MGP Card	29
Parallel/2 Serial/Game Card	29
RL1 16bit 11 Hard/Floppy Disk Cont.	59
XT 144 Dual Floppy Controller	35

FastData Monitors

14" Amber or White TTL Mono	99
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FastData 2496 SR FaxModem \$69

A great value, the FastData 2496 SR is an internal modem with 9600 send and receive fax works with all industry standard PC's and includes BitFax software, and is configurable from COM 1 - COM 4. Its made in the U.S. and uses a Sierra chip for reliability.

14" White VGA Mono	119
14" CGA Color .52 dot pitch	199
14" Super VGA 1024x768 28 dp	299
14" Non-Int VGA 1024x768 28 dp	329



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DATABASE & FORMS

askSam 5.0	209
Clanion Personal Developer	45
Clanion Professional Developer 3.0	449
Clipper 5.01	489
DataCase	509
dBase III+	419
dBase IV 1.5	479
w DBlast for Windows	319
dBXL V	129
FormTool Gold	52
Formfiller	79
w FormWork for Windows	199
Formbase Plus	229
FormPro	449
Paradox 4.0	519
Paradox Competitive Upgrade	165
Paradox SE	65
PerForm Designer & Filler	89
w PerForm Pro	179
Personal Rbase	69
Q & A 4.0	249
Rbase 4.0	447

DESKTOP PUBLISHING

Reflex	159
Bannermania	21
Express Publisher DOS/Win	99/99
w Microsoft Publisher	129
w Pagemaker	489
w PFS Publisher	89
Printshop	33
Publisher's Paintbrush	279
Publish It!	89
w Ventura Publisher for Windows	499
w Ventura Database Publisher	179



Smartcom Exec \$69

Powerful communications software that combines terminal emulations, error-control protocols, and a text editor to meet the needs of virtually any user. In addition to modem sharing support over a LAN, Smartcom Exec provides SCOPE scripting language, keyboard macros, mouse control and more. It provides options for installation in one or more languages (English, French, Italian, Spanish or German) and multi-language documentation. Smartcom Exec also supports popular terminals emulations and error-control file transfer protocols.

ENTERTAINMENT

AutoMap U.S.A./Europe	45/75
BodyWorks/Orbits	39/29
Carmen San Diego Deluxe Edition	38
F-119 Stealth Fighter	36
Falcon 3.0	45
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry V	38
w Microsoft Ent. Pack I, II or III	27
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
w Microsoft Golf	47
PC Globe or PC USA	36
Simsity or Simsity for Windows	28
SimEarth	39
Wing Commander I/II	39/45

FINANCIAL

Peachtree for Windows \$69

Peachtree Accounting comes to Windows! It combines the easy to use graphical interface of Windows with powerful accounting features. This fully integrated system includes Gen. Ledger, Accts. Rec., Inventory, Assets Payable, Payroll, Inv. and Job Costing. Writing checks is on-screen easy, and bank reconciliation is practically automatic. Plus its custom forms, report writer & data exchange really flex to your needs.



ACCPAC BPI Value Pak	359
ACCPAC Simply Accounting DOS	119
w ACCPAC Simply Acctg Windows	119
DAC Accounting 4.2	85
DAC Bonus Pack 4.2	119
DAC Accounting Upgrade	45
Managing Your Money	47
w Microsoft Money for Windows	45
Money Matters	29
w M.Y.O.B.	129
One Write Plus GL, AP & A/R	79
Pacoli 2000	29
Peachtree Basic Acctg.	69
PeachPay	49
w Peachtree Acctg. for Windows	69
Peachtree Complete 6.0 (with DQ)	169
Peachtree Network Accounting	279
w Quicken for Windows	41

SOFTWARE

W = Windows Software

FINANCIAL CONT.

Quicken DOS	41
QuickBooks	85
QuickBooks with QuickPay	109
The Manager's Organizer	139
Timeslips III	179
Wealth Builder	89

GRAPHICS

w 3-D Charts to Go for Windows	55
w Adobe Illustrator 4.0	359
Autosketch 3.0 DOS/Windows	139/169
w CA-Crocket Draw	175
w Corel Draw 3.0	369
Design CAD 3-D	235
DrawPerfect	259
w Freehand	389
Freelance-Graphics 4.0	Call
w Freelance Graphics for Windows	299
Freelance Competitive Upgrade	89
w Hollywood	299
Generic 3D Drafting	199
Generic Cadd Level 2 Starter Kit	85
Generic Cadd 6.0	279
Harvard Graphics DOS	239
w Harvard Graphics Windows	Call
w Micrograph Designer	449
w Microsoft Powerpoint	309
PC Paintbrush IV Plus	109
w Persuasion	319
w Publisher's Paintbrush	279

SPREADSHEETS CONT.

w 1-2-3 Competitive Upgrades	59ea
Always	115
w Excel 4.0	299
w Excel 4.0 Comp./Vers. Upgr	119/95
Quattro Pro 4.0	299
Quattro Pro 4.0 Comp. Upgrade	89
Quattro Pro SE	45
w Quattro Pro for Windows	Call
Supercalc 5.2	89

WORD PROCESSORS

w Ami Pro 3.0	249
w Ami Pro 3.0 Comp. Upgrade	Call
w CA-Text	85
w Correct Grammar	57
Facit for WordPerfect	57
w Grammatik IV for Windows	55
Grammatik V	55
w JustWrite	125

WordPerfect for Windows \$249

The #1 Word Processor comes to Windows! WordPerfect 5.1 for Windows is simple, powerful and fun to use. WPWin includes customizable ButtonBar™ Dynamic Data Exchange, and full graphical integration. Upgrade from WP for DOS for \$79.

LetterPerfect	85
w WordPerfect for Windows	249
Microsoft Word for DOS	208
w Microsoft Word for Windows	298
w Pro Write Plus	159
MultiMate 4.0	239
PC Write Standard Level	59
Professional Write	159
Publisher's PowerPak / WordPerfect	45
Rightwriter DOS	55
w RightWriter for Windows	55
WordPerfect 5.1	249
w WordPerfect for Windows	249
w WordPerfect DOS to Win Upgrade	79
WordPerfect Adult Station License	159
WordPerfect Office	89
w WordStar for Windows	89
WordStar Pro	259
Writers Toolkit DOS/Windows	79/79

UTILITIES - DOS

386 MAX	59
Address Book Plus	47
Calendar Creator Plus	39
Carbon Copy Plus	107

Close-Up 4.0 Dual Pack \$119

Winner of PC Magazine Editor's Choice & PC World's Best Buy. Close-Up is the ideal way to run another PC remotely via modem. It runs remote DOS and Windows applications with the fastest remote screens and file transfers ever. Special Dual Pack includes host & remote.

Central Point Anti-Virus	79
Central Point Backup	75
Central Point Commute	75
CheckIt	79
Company Ladder	45
CoreFast	60
Desqview 2.4	75
Desqview 386 2.4/6.0	125
Direct Access	57
Disk Manager Dos / Novell	36/119
Disk Optimizer	29
DR DOS 6.0	65
DosFax Pro	49
Fastback Plus	109
GoScript 4.0	89
InfoSpotter	45
Labels Unlimited	59
Laplink Pro	95

UTILITIES - DOS CONT.

Microsoft Learning DOS	32
MS-DOS 5.0 Upgrade	55
Norton AntiVirus	79
Norton Backup	85
Norton Desktop for DOS	109
Norton Utilities	109
PC Anywhere IV	109
PC Tools Deluxe 7.1	105
Personal Lawyer	15

Outside In for Windows \$119



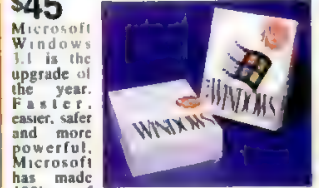
Outside In for Windows is a file viewing and data import utility. It lets you reuse data that already exists. Use Outside In to quickly look at a fully formatted view of a file. Select all or part of the file and Outside In will copy data to the clipboard for use in any program. Use the power of Windows without giving up all of your DOS files.

P.D. Queue	55
Pop Drop Plus	53
PrintRate	19
ProComm Plus	65
Prodigy	25
QA Plus	85
QEMM 386 6.0	57
QRAM 2.0	49
SideKick 2.0	59
Slideways	55
Smartcom Exec	69
SpitFile II	69
Stacker	79
Stacker XT8 / AT16	149/179
Super PC Kwik	49
Virex-PC	75
XTree Gold 2.5	89

UTILITIES - WINDOWS

w Adobe Type Sets	Call
w Adobe Type Align	59
w Adobe Type Manager	59
w Adobe Type Manager Plus Pack	115
w After Dark for Windows	25
w BeckerTools	37
w Bitstream MakeUp	89
w CA-Up To Date	89
w CA-SuperProject for Windows	59
w Direct Access Windows	80
w Hijaak	125
w Instant Orgchart	119
w Lotus Organizer	89
w MacPhone II	89
w Microsoft Mouse w/ Windows 3.1	147
w Microsoft Productivity Pack	39
w Microsoft Project for Windows	429
w Microsoft TrueType Font Pack	89
w Microsoft Windows 3.1	89
w Norton Backup	85
w Norton Desktop	109
w On Target	239
w PackRat 4.0	239
w ProComm Plus for Windows	85
w Publisher's Powerpak	45
w WideAngle for Windows	59
w Winconnect	59
w WinFax Pro	69

Windows 3.1 Upgrade \$45



Microsoft Windows 3.1 is the upgrade of the year. Faster, easier, safer and more powerful. Microsoft has made 100's of improvements to benefit advanced users and novices alike. It includes new TrueType® scalable fonts and new MultiMedia features. It includes an improved File Manager, faster and more efficient memory use, Express Install, improved printing speed, new built-in tutorial, special enhancements for laptop users, and a whole lot more. To upgrade, you must have an earlier Windows version.

Notebook Software Essentials \$97

Save big on this special bundle of DOS productivity software and utilities for the active notebook computer user. Includes PC Magazine's Editor's choice FastVnx file transfer software with parallel and serial cables. Also includes FastLock password protection. FastJuce battery monitor, MergeIt phonLas, SitBack hard disk backup, Maximizer contact manager, CO-Session remote access, EZC smart cursor and more!



dBFast \$329

dBFast provides a database, development language and programming environment that lets you write, compile and debug your programs from within the flexible Windows environment. Leverage your knowledge of dBase, Clipper or FoxBase and create programs with all the graphical features of Windows without the long learning curve. Virtually all dBase III Plus programs will run under Windows. dBFast supports multi-user data sharing over a Local Area Network. The flexibility adds new life to your existing applications and lets you create new ones quickly and easily.



After Dark 2.0 \$25

After Dark is the most advanced screen saver for Windows. Choose from over 40 screens, including the famous Flying Toasters. You can also password protect entry to Windows with Windows Shutter. SystemIQ monitors activity and maximizes performance while running After Dark. Also includes digital sound and DOS blanking.



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- AZ orders add 6.7% tax.

Shipping Information

- All orders up to 20 pounds are shipped via Airborne Express.
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- AK, HI, & APO addresses add \$15 per box.
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- International orders: Fax 602-437-8622 for shipping costs before ordering.

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Phoenix, AZ 85044
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- No returns on used items (except FastData branded products).
- All opened returns are subject to 15% restocking fee (except FastData branded products).
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- Sorry, shipping is not refundable.



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Let PCs Compleat put your entire system together and eliminate installation hassles. Our technicians will install your application software for free. We'll also install extra memory, network cards, peripherals—even configure your printer driver—at no charge. Just take your PC out of the box, plug it in, and go to work!

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PCs Compleat can have you up and running on your new system by tomorrow morning, using overnight delivery.* If your order for a standard, in-stock configuration is received with an approved payment method by 4:00 p.m. EST Monday through Friday, we guarantee to ship it that day—or we'll pay your delivery and insurance charges.

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ABOUT PCS COMPLEAT.

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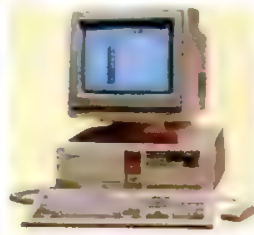
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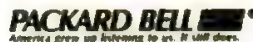
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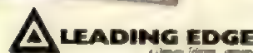
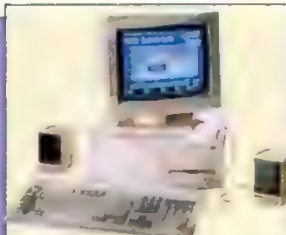
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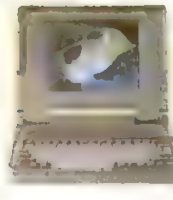
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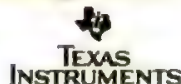
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USER-TO-USER

Easier Assembly with DEBUG: A batch file that automates assembling programs with DEBUG.

BY NEIL J. RUBENKING

Easier Assembly with DEBUG

The method of using a DEBUG script file to produce small programs in .COM file format can be tedious, nerve-racking and error-prone. Figure 1 shows an example modified from a previous User-to-User column. In this script, it's not immediately obvious that the instruction `JNZ 10B` doesn't actually jump back two lines, or that the 14 after `RCX` is not the correct length of the program. And of course, omitting the blank line before the `RCX` line or after the final `Q` would produce unpleasant results.

`DBA.BAT` (DeBug Assembler), shown in Figure 2, helps the user concentrate on assembler programming details instead of DEBUG requirements. Figure 3 shows the same `ALTPAUSE` program, this time in `DBA` format. Note the lack of DEBUG commands and the symbols `0108;;ERRLEV1` and `010B;;TEST`, used both in jump instructions and in the lines with the comment "simulated label."

Figure 4 shows a `PASS 1` run, the result of the command `dba altpause`. To help isolate addressing errors, only lines containing double semicolons (;;) are displayed. The first simulated label line appears as

```
396A:0109;10B;;ERRLEV1
```

meaning that all occurrences of the line `0108;;ERRLEV1` in the source should be changed to `0109;;ERRLEV1`. Note that just changing `0108` to `0109` would affect other pseudo symbols coincidentally having a value of `0108`. There aren't likely to be any, but for safety always use the full simulated label name.

The last two lines remind the user how to calculate the program length required to run `PASS 2`. Figure 5 shows the result of the command `dba altpause 16`, and

ALTPAUSE.SCR

Complete Listing

```
A100
MOV AX,40
MOV DS,AX                ; BIOS data segment 0040h
MOV AL, 0                ; prepare 0 for errorlevel
JMP 10B                  ; jump to test
MOV AL, 1                ; put 1 in errorlevel
TEST BYTE PTR [17],0F    ; test shift state byte
JNZ 10B                  ; if any shift pressed, jump back 2 lines
MOV AH,4C                ; exit with errorlevel set to AL
INT 21

RCX
14
NALTPAUSE.COM
W
Q
```

Figure 1: This DEBUG script attempts to create the `ALTPAUSE` program, but one of the jump addresses is wrong, and the size is also incorrect.

DBA.BAT

Complete Listing

```
@echo off
if exist %1.DBA goto :PREP
if not '%1'=='' echo File does not exist: %1.DBA
echo PASS 1='DBA name' PASS 2='DBA name length'
goto :EXIT

:PREP
echo>@10 A 100
echo>@20 ;____;END: LENGTH = (END-0100H)
echo>@20/
if '%2'=='' goto :PASS1
echo>@20 U 100 L %2
echo>@20 D 100 L %2
echo>@20 RCX
echo>@20 %2
echo>@20 N %1.COM
echo>@20 W

:PASS1
echo>@20 Q
copy %10+%1.DBA+@20 %30 >nul
debug <@30 >%1.DBL
find <%1.DBL " Error" > %40
copy %40 %50 >nul
if not exist %50 goto :NOERR
if exist %1.com del %1.com
type %1.dbl
echo ==== Fix DEBUG syntax errors and re-run this pass
goto :exit

:NOERR
find <%1.DBL ";;"
if '%2'=='' echo ==== PASS 1: If addresses ok: DBA %1 LENGTH
if not '%2'=='' echo ==== PASS 2: If addresses ok: %1

:EXIT
if exist %70 del %70
```

Figure 2: This batch file lets you concentrate on assembler details rather than DEBUG requirements.



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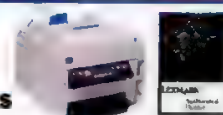
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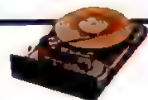
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Code # PM10B2



ALTPAUSE.DBA

Complete Listing

```

MOV  AX,40
MOV  DS,AX          ; BIOS data segment 0040h
MOV  AL, 0          ; prepare 0 for errorlevel
JMP  10B;;TEST      ; jump to test
;10B;;ERRLEV1       ; simulated label
MOV  AL, 1          ; put 1 in errorlevel
;10B;;TEST          ; simulated label
TEST BYTE PTR [17],0F ; test shift state byte
JNZ  10B;;ERRLEV1   ; if any shift pressed, jump back 2 lines
MOV  AH,4C          ; exit with errorlevel set to AL
INT  21

```



Figure 3: The DBA batch file expects as its first parameter the name of the DBA file to be assembled. In this version of the ALTPAUSE script, there are no extraneous DEBUG instructions, and each jump destination is associated with a name.

DBA's OUTPUT

Pass 1

```

396A:0107 JMP 10B;;TEST      ; jump to test
396A:0109 ;10B;;ERRLEV1
396A:010B ;10B;;TEST
396A:0110 JNZ 10B;;ERRLEV1   ; if any shift pressed, jump back 2 lines
396A:0116 ;____;;END: LENGTH = (END-0100H)
===== PASS 1: If addresses ok: DBA altpause LENGTH

```

Figure 4: Comparing the simulated labels with the actual offsets in the left-hand column shows that the label 10B;;ERRLEV1 should be changed to 109;;ERRLEV1 wherever it appears. Also, the program size is 16h, not the 14h shown in ALTPAUSE.SCR.

DBA's OUTPUT

Pass 2

```

396A:0107 JMP 10B;;TEST      ; jump to test
396A:0109 ;109;;ERRLEV1
396A:010B ;10B;;TEST
396A:0110 JNZ 109;;ERRLEV1   ; if any shift pressed, jump back 2 lines
396A:0116 ;____;;END: LENGTH = (END-0100H)
===== PASS 2: If addresses ok: altpause

```

Figure 5: After you've corrected the ERRLEV1 address, a second pass through DBA.BAT successfully produces ALTPAUSE.COM.

ALTPAUSE.DBL

Complete Listing

<pre> -A 100 396A:0100 MOV AX,40 396A:0103 MOV DS,AX ; BIOS data segment 0040h 396A:0105 MOV AL, 0 ; prepare 0 for errorlevel 396A:0107 JMP 10B;;TEST ; jump to test 396A:0109 ;109;;ERRLEV1 396A:0109 MOV AL, 1 ; put 1 in errorlevel 396A:010B ;10B;;TEST 396A:010B TEST BYTE PTR [17],0F ; test shift state byte 396A:0110 JNZ 109;;ERRLEV1 ; if any shift pressed, ; jump back 2 lines 396A:0112 MOV AH,4C ; exit with errorlevel set to AL 396A:0114 INT 21 396A:0116 ;____;;END: LENGTH = (END-0100H) 396A:0116 -U 100 L 16 396A:0100 B84000 MOV AX,0040 396A:0103 8ED8 MOV DS,AX 396A:0105 B000 MOV AL,00 396A:0107 EB02 JMP 010B </pre>	<pre> 396A:0109 B001 MOV AL,01 396A:010B F60617000F TEST BYTE PTR [0017],0F 396A:0110 75F7 JNZ 0109 396A:0112 B44C MOV AH,4C 396A:0114 CD21 INT 21 -D 100 L 16 396A:0100 B8 40 00 8E D8 B0 00 EB 02 B0 01 F6 06 17 00 0F .0.... 396A:0110 75 F7 B4 4C CD 21 u..L.! -RCX CX 0000 :16 -N altpause.COM -W Writing 00016 bytes -Q </pre>
---	---



Figure 6: For your convenience, DBA.BAT logs its own output and includes both a disassembly and a hex dump of the created program. DBA is unable to confirm the validity of the length supplied by the user, so the disassembly listing is very important.

Figure 6 shows the listing file produced by DBA. Note the DEBUG commands (U, D, RCX, N, W) that have been added to enhance the listing and produce the .COM file. The disassembly listing is especially important, as DBA is unable to confirm the validity of the length supplied by the user.

Figure 7 shows the listing file generated by running DBA.BAT on the file CATCH.DBA, using the command dba catch 22. It illustrates a number of points:

- PASS 1 can be skipped if the program length is known in advance.
- When DEBUG indicates an error, the complete listing is displayed and no .COM file is produced.
- DB, DW, and ORG directives can be used but may result in an unintelligible disassembly listing. In addition, ORG may overwrite previously assembled code.
- Some instruction formats don't allow addresses to be immediately followed by ";;" (such as [0106].AX;;V3); this makes the detection of addressing errors even more difficult.

Although by no means a full-featured assembler, DBA does simplify using DEBUG to produce and maintain small utility programs. Possible enhancements could include adding a DEBUG F command to prefill program space with NOPs, and including a final RET or INT 20 to prevent runaway programs. Recoding the file in an actual programming language to automate program length calcu-

lation and address verification is an exercise best left to the reader.

*Al Dunbar
Edmonton, Alberta
Canada*

► **PC MAGAZINE** This batch file is a wonderful boon to those of us who use DEBUG to assemble tiny .COM files. I've used a similar technique for years, but never thought to automate it in a batch file. It's very easy to make a mistake counting the bytes for a JMP instruction or to omit the all-important blank line after the last ASM instruction. DBA scripts carry less baggage than straight DEBUG

scripts and thus let you concentrate on assembly programming, not on putting blank lines in the right spots. You do have to give names to any memory locations referenced in the program, but that effort is well rewarded.

How does it work? DBA.BAT expects either one or two parameters, the first of which is the name of the DBA file to be assembled (without the DBA extension). If the file doesn't exist, or if the first parameter is empty, DBA prints its syntax on the screen. If the file does exist, DBA uses the ECHO command and redirection to create the files @1@ (containing the line A100) and @2@ (contain-

ing a comment explaining how to calculate the program's length, and a blank line). After assembly, the offset of this comment minus 100h is the length of the program.

If there is no second parameter, this is the first pass through the file, and DBA skips ahead to the label PASS1. Here it adds a line containing Q to the @2@ file and builds a file @3@ by concatenating @1@, the DBA file, and @2@. It redirects the script in @3@ into DEBUG, collecting DEBUG's output in a file with the same name as the DBA file and the extension DBL. If DEBUG has encountered any errors in the input, DBA warns the user; if not, it uses FIND to filter out all lines except those containing the ";" character sequence and to display them on the screen. You may want to add ; MORE at the end of the FIND line if you use DBA to assemble programs with a large number of simulated labels.

The first pass showed the size of the program; for the second pass, you add that size on the command line after the program's name. The processing is much the same, but the jump to the label PASS1 does not occur. This results in a number of other instructions being added to the @2@ file: instructions to display a disassembly of the program, dump the program's contents to the screen, and perform the actual assembly.

I'm sure you'll find DBA.BAT useful in creating your own DEBUG scripts. Do note that it creates and deletes a number of temporary files of the form @?@, where "?" represents a number from 1 to 5. If you have other programs that use this filename pattern, you'll want to change it in DBA.BAT. You can download all files mentioned above from PC MagNet, archived as DBA.ZIP. □

CATCH.DBL Complete Listing

```
-A 100
396A:0100 ; CATCH.DBA: shows DEBUG errors, DB, DW, and ORG
396A:0100 ;
396A:0100      JMP      011B;;CODE      ; jump over data
396A:0102 ;0102;;V1                      ; variable 1
396A:0102      DW       1234
396A:0104 ;0104;;V2                      ; variable 2
396A:0104      DW       2345
396A:0106 ;0106;;V3                      ; variable 3
396A:0106      ORG      0110;;COPYRIGHT
396A:0110 ;0110;;COPYRIGHT
396A:0110      DB       '(C) 1991' 0d 0a 00
396A:011B ;011B;;CODE
396A:011B      MOV      AX,[0102];;V1    ; fetch first value
396A:011E      ADD      AX,V2            ; add second???
396A:011E      ^Error
396A:011E      MOV      [0106],AX;;V3    ; store result
396A:0121      DROP DEAD                ; not likely!
396A:0121      ^Error
396A:0121      RET
396A:0122 ;____;;END: LENGTH = (END-0100H)
396A:0122
-U 100 L 22
396A:0100 EB19      JMP 011B
396A:0102 3412     XOR AL,12
396A:0104 45       INC BP
396A:0105 2300     AND AX,[BX+SI]
396A:0107 0000     ADD [BX+SI],AL
396A:0109 0000     ADD [BX+SI],AL
396A:010B 0000     ADD [BX+SI],AL
396A:010D 0000     ADD [BX+SI],AL
396A:010F 0028     ADD [BX+SI],CH
396A:0111 43       INC BX
396A:0112 2920     SUB [BX+SI],SP
396A:0114 3139     XOR [BX+DI],DI
396A:0116 3931     CMP [BX+DI],SI
396A:0118 0D0A00   OR AX,000A
396A:011B A10201   MOV AX,[0102]
396A:011E A30601   MOV [0106],AX
396A:0121 C3       RET
-D 100 L 22
396A:0100 EB 19 34 12 45 23 00 00-00 00 00 00 00 00 00 00 00 ..4.E#.....
396A:0110 28 43 29 20 31 39 39 31-0D 0A 00 A1 02 01 A3 06 (C) 1991.....
396A:0120 01 C3
-RCK
CX 0000
:22
-N catch.COM
-W
Writing 00022 bytes
-Q
```



Figure 7: This DBA log file is the result of a failed attempt to assemble the file CATCH.DBA. It helps you determine just what went wrong.

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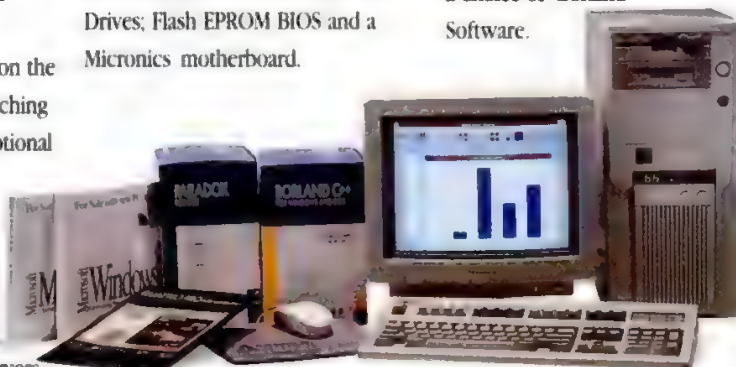
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SPREADSHEETS

Converting Case: An Excel macro that converts text to any case you need.

BY CRAIG STINSON

Converting Case

I copy a lot of data from mainframe computers into Microsoft Excel. Most of this data is in uppercase, which doesn't always look good in presentations. So I wrote the macro shown in Figures 1 and 2 to convert the imported text from uppercase to proper case or lowercase. The macro also allows me to convert the material back to all caps in case I need to do that.

When you run the macro, a dialog box prompts you for the type of text formatting to apply to the range you have selected. The macro then begins to convert the text while displaying a "% complete" message in the status bar. This macro saves our group a significant amount of time.

Paul Simmons
St. Louis, Missouri

► **PC MAGAZINE** Mr. Simmons's macro works as described, provided the selection to be processed contains nothing but text cells. If the selection includes blanks, the macro still converts text correctly, but the percentage-complete message in the status bar gives out erroneous information. That message is created by the following text formula, in B6:

```
=MESSAGE(TRUE,Total.Cells&" cells are  
being processed, "&TEXT(1-  
(pCells.Left/Total.Cells),  
"%")&" complete...")
```

Similar formulas appear in B15 and B24. The formula in B15 uses the variable uCells.Left in place of pCells.Left; the formula in B24 uses the variable lCells.Left in place of pCells.Left. Before any of these text formulas are executed, the variable Total.Cells has been initialized by the formula

```
=COUNTA(Selection())
```

which returns the number of nonblank values in the area selected when you run the macro. As the macro steps through its FOR.CELL loop, the cells-left counter (pCells.Left, uCells.Left, or lCells.Left) is decremented once for each cell in the selection, and the status bar message reports the percentage of total cells remaining to be converted. All's

well if the selection is solid text. But if the selection includes blanks, the cells-left counter gets decremented more times than there are total cells to convert (as reported by COUNTA), and the status-bar message becomes incorrect.

One way to avoid this anomaly is to replace the COUNTA function with an array formula of the form

```
(=SUM(ISTEXT(Selection())*1))
```

CASE.XLM A1:C40

	A	B	C
1		Apply_Proper	Converts To Proper Case
2		=SET.VALUE(pCells.Left,Total.Cells)	
3		=FOR.CELL("CurrentCell")	
4		=FORMULA(LOWER(CurrentCell),CurrentCell)	
5	pCells.Left	=pCells.Left-1	
6		=MESSAGE(TRUE,Total.Cells&" cells are being processed, &TEXT(1-pCells.Left/Total.Cells),"0%")&" complete...")	
7		=NEXT()	
8		=RETURN()	
9			
10		Apply_Upper	CONVERTS TO UPPERCASE
11		=SET.VALUE(uCells.Left,Total.Cells)	
12		=FOR.CELL("CurrentCell")	
13		=FORMULA(UPPER(CurrentCell),CurrentCell)	
14	uCells.Left	=uCells.Left-1	
15		=MESSAGE(TRUE,Total.Cells&" cells are being processed, &TEXT(1-uCells.Left/Total.Cells),"0%")&" complete...")	
16		=NEXT()	
17		=RETURN()	
18			
19		Apply_Lower	converts to lowercase
20		=SET.VALUE(lCells.Left,Total.Cells)	
21		=FOR.CELL("CurrentCell")	
22		=FORMULA(LOWER(CurrentCell),CurrentCell)	
23	lCells.Left	=lCells.Left-1	
24		=MESSAGE(TRUE,Total.Cells&" cells are being processed, &TEXT(1-lCells.Left/Total.Cells),"0%")&" complete...")	
25		=NEXT()	
26		=RETURN()	
27			
28		Format_Text	
29	User.Button	=DIALOG.BOX(Text_Dialog)	
30		=IF(User.Button=FALSE,RETURN())	
31	Total.Cells	=COUNTA(Selection())	
32		=IF(Text_Option=1)	
33		=Apply_Proper()	
34		=ELSE.IF(Text_Option=2)	
35		=Apply_Upper()	
36		=ELSE.IF(Text_Option=3)	
37		=Apply_Lower()	
38		=END.IF()	
39		=MESSAGE(FALSE)	
40		=RETURN()	

Figure 1: This Microsoft Excel macro allows you to convert text to proper case, uppercase, or lowercase.

(To create this array formula, type it as shown here but without the braces. Then press Shift-Ctrl-Return, instead of Return, to enter the formula.) In the alternative form of Mr. Simmons's macro, shown in Figure 3, this array formula appears in B5. The text formula used to create the status bar message (B11) is the same as in Figure 1.

Figure 1 actually lists four separate macros. The code in B28:B40, named **Format_Text**, displays the dialog box shown in Figure 4, then uses a set of IF statements to branch to one of the other three macros. These other three macros, which are named **Apply_Proper**, **Apply_Upper**, and **Apply_Lower**, are stored in B1:B8, B10:B17, and B19:B26, respectively. Presumably, the user will invoke the macro at B28 and make a pick in the

dialog, but a knowledgeable user might also use the Macro Run command and go straight to one of the three processing routines.

If you're entering the macro manually, be sure to define the names in column A for the cells just to the right of them. Also define cell F1 as **Text_Dialog** and cell L4 as **Text_Option**.

In my suggested revision, I've eliminated the user's straight-to-the-gut option in favor of more compact and consequently more readable code. The version of the macro that is shown in Figure 3 uses the following CHOOSE formula to carry out the desired text conversion:

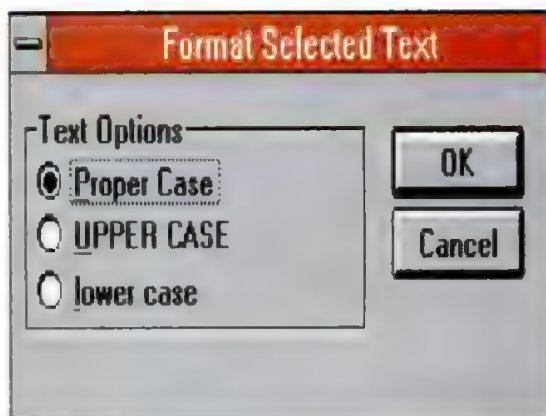


Figure 4: The dialog box displayed by our text-converting macro.

```
=CHOOSE(Text_Option,FORMULA
(PROPER(CurrentCell),CurrentCell),
FORMULA(UPPER(CurrentCell),
CurrentCell),FORMULA(LOWER
(CurrentCell),CurrentCell))
```

CASE.XLM E1:L9

	E	F	G	H	I	J	K	L
1	Text_Dialog	ITEM	X	Y	WIDTH	HEIGHT	TEXT	INITIAL/RESULTS
2					358	102	Format Selected Text	
3		14	9	10	228	67	Text Options	
4		11						2
5		12					&Proper Case	
6		12					&UPPER CASE	
7		12					&lower case	
8		1	251	17	88		OK	
9		2	251	41	88		Cancel	

Figure 2: The dialog box definition range for the macro in Figures 1 and 3.

CASE2.XLM A1:B16

	A	B
1		Format_Text (Ctrl-F)
2	User.Button	=DIALOG.BOX(Text_Dialog)
3		=IF(User.Button)
4		= ECHO(FALSE)
5	Total.Cells	= {SUM(ISTEXT(SELECTION())*1)}
6	Cells.Left	= Total.Cells
7		= FOR.CELL("CurrentCell")
8		= IF(ISTEXT(CurrentCell))
9		= CHOOSE(Text_Option,FORMULA(PROPER(CurrentCell),CurrentCell), FORMULA(UPPER(CurrentCell),CurrentCell),FORMULA(LOWER(CurrentCell), CurrentCell))
10		= SET.VALUE(Cells.Left,Cells.Left-1)
11		= MESSAGE(TRUE,Total.Cells&" cells are being processed, "&TEXT(1- (Cells.Left/Total.Cells),"0%")&" complete...")
12		= END.IF()
13		= NEXT()
14		=END.IF()
15		=MESSAGE(FALSE)
16		=RETURN()

Figure 3: An improved case-converting macro.

I've made two other minor changes in Figure 3. Mr. Simmons's code uses the instruction

```
=IF(User.Button=FALSE,RETURN())
```

to bail out if the user responds to the dialog box by clicking Cancel or pressing Esc. As long as this IF test returns FALSE, the macro goes on its way, performing the requested services. I prefer inverting the IF test so that the macro continues only when the IF returns TRUE. This necessitates framing the processing steps with IF and END.IF, but it results in a macro with a single RETURN statement.

Finally, I've enclosed the actual processing step (the CHOOSE formula) within another IF/END.IF frame so that the macro won't try to convert nontextual cells. If you always apply this macro to ranges that include nothing but text, you can save a few cycles by eliminating the statements in B8 and B12. □

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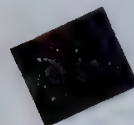
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CIRCLE 045 ON READER SERVICE CARD

CONNECTIVITY

Double-Duty Computers: Simple products make it easy to extend screens and keyboards. Punch-Down Blocks: Are they a necessary part of a network?

BY FRANK DERFLER, JR.

Double-Duty Computers

In our condominium office we have one computer that holds rental and condo association dues payment information. Normally only one clerk works at a time, so we don't need another computer, but we do need to access the computer from both the front desk and the back office. Is there some simple way to use the same computer from two locations?

*Chris Homes
Washington, DC*

► **PC MAGAZINE** Cybex Corp. (205-534-0011) makes a variety of products that solve the problems of using multiple screens and keyboards on one PC, or using one keyboard and screen on multiple PCs. Some can extend the screen and keyboard out as far as 600 feet from the PC. This is simple plug-and-play hardware. You don't have to put any software or special adapters in the PC.

Cybex's Companion is ideal for your situation; it allows dual operation of one PC from two locations. You can arrange the system so it will operate from one location at a time or from both simultaneously. The company markets versions of the Companion designed for different video configurations, each carrying a different price tag. A VGA system that can span 50 feet of cable costs about \$350.

Punch-Down Blocks

Our public accounting firm is getting ready to install a 10BaseT NetWare 3.11 network. I'm not sure, though, why you must use a 66 block (punch-down block) to make connections. I've seen small 5-node nets that terminate straight into the concentrator. This seemed an elegant

way to do things. We're putting in 30 nodes, 8 of which are Xircoms. Can I avoid the punch-down block?

*Bill Rehm
via CompuServe*

► **PC MAGAZINE** The simple answer to your question is yes: You can avoid using any type of punch-down or splice-block device. Instead of terminating each wire span on a block, you can simply bring it into the wiring closet, crimp an RJ-45 connector on the end, and plug it into the wiring hub. In some ways you might be better off, since each wire wrap on the punch-down block presents another potential point of poor contact, oxidation, rectification, and noise. That scenario, however, assumes that all wire pairs are usable when you install them and that they will stay that way forever. They aren't and they won't!

If you have a direct-wired system, then, when you find a bad wire pair, it's difficult to use a spare pair. On the other hand, if you have a punch-down block, the task is relatively easy.

Also, users' requirements constantly change, as do their locations. You can run multiple spare-wire pairs to many places, terminating all of them neatly and efficiently on a high-quality punch-down block. Add a patch panel and you can quickly utilize spare cable spans to meet unanticipated needs.

Is a WaveLAN Network Limited?

At the end of the NCR WaveLAN review in the February 11, 1992, issue of *PC Magazine* ("Portable, Affordable, Secure: Wireless LANs"), you expressed the wish that NCR had emulated the NE-2000 (Novell's popular LAN adapter

card) so that WaveLAN could "take advantage of its huge library of software." My company is considering WaveLAN and we expect the system to grow eventually to 30 or 40 nodes. We're concerned: Are there specific applications that may not run over a WaveLAN system?

*Mark Lemoine
via CompuServe*

► **PC MAGAZINE** Don't worry, you won't lose any functionality with WaveLAN. As that review points out, the WaveLAN adapters come with drivers for both the NDIS and ODI driver specifications, so the adapters will work with network operating systems as diverse as LAN Manager, NetWare, NetWare Lite, and VINES. You can set up multiple protocol stacks over ODI, for example, for simultaneous IP and IPX operation.

If NCR had emulated the NE-2000, you would also be able to use multi-protocol software from The Clarkson Packet Driver Collection, and you'd have the option of using customized smaller and possibly faster drivers for products like VINES and for many TCP/IP packages.

Emulating the NE-2000 would enhance the ability to use existing drivers, but WaveLAN includes plenty of functionality in its present configuration. □

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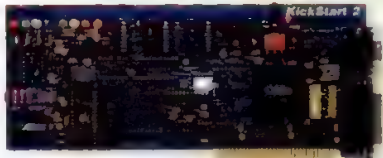
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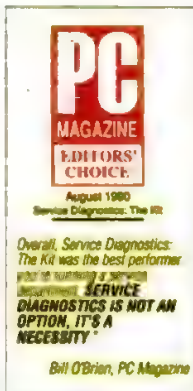
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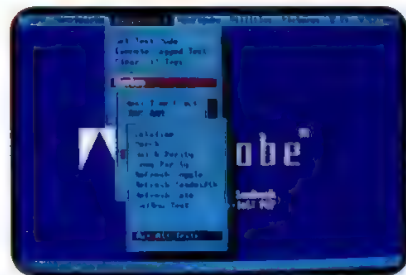


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CIRCLE 169 ON READER SERVICE CARD

THE WORKING WORD

File-Retrieving Macro: Streamline WordPerfect's retrieve procedure. Spell-Checking Doubled Words: Don't let your spell-checker get stumped.

BY M. DAVID STONE

File-Retrieving Macro

One of WordPerfect's least endearing qualities is the way it retrieves files. If you unthinkingly start from a window with anything in it—even a single space or formatting code—then press the F5 key to go to the List Files screen and try to retrieve a file, WordPerfect will reward you with the message, "Retrieve into current document? No (Yes)." Answer no and WordPerfect cancels the command.

If you want to load the file rather than merge a copy of it into the current file, you have to exit the List Files screen, close the current document or switch to the other document window, and then give the List Files and Retrieve commands again. This can be annoying, especially if you've just threaded your way through several directories looking for the file you want to retrieve.

Here's a simple macro that lets you recover with one keystroke:

```
N{Exit}{Switch}{List}{List}R
```

The macro answers no (to cancel the retrieve command), exits back to the document screen, switches to the other document window, returns to the List Files screen, and retrieves the file.

*Steven Goldberg
New York, New York*

► **PC MAGAZINE** This macro takes advantage of a relatively obscure WordPerfect technique: using two {List} ([List Files] in Version 5.0) commands in a row. This sequence tells WordPerfect to use the last directory you looked at during the current session, with the highlight bar on the

filename where you last had it. When you type F5, Enter, you get a listing of files in the default data-file directory.

Although this capability has been present since Version 5.0 and is documented in the 5.1 manual, I'd bet that most WordPerfect users are not aware of it, since it's not mentioned on the Help screen for List or shown as an option after you press F5 the first time.

This short macro's simplicity is alluring, but it does have one problem you should be aware of: It assumes that the other window is free to have a file loaded

into it. Figure 1 shows a more sophisticated and much longer version of the macro. The new macro uses the {CHAR} and {CASE} commands to ask questions and act on the answers. (This macro will not work in Version 5.0 or earlier, because these versions don't support the {STATUS PROMPT}, {PAUSE KEY}, and {OTHERWISE} commands.)

Briefly, when you start the macro in response to the "Retrieve into current document?" message, it exits from the List Files screen and asks whether to retrieve the file into the current window or

LOAD.WPM

Complete Listing

```
n{Exit}
{LABEL}ReStart ~
{CHAR}Which ~ Retrieve file into (C)urrent or (O)ther window? ~
{CASE}{VARIABLE}Which ~ ~
  c ~ Current ~
  C ~ Current ~
  o ~ Other ~
  O ~ Other ~
{OTHERWISE} ~ ReStart ~ ~
{LABEL}Current ~
{CHAR}SaveOrNot ~ Save current file first? (Y/N) ~
{CASE}{VARIABLE}SaveOrNot ~ ~
  Y ~ Yes ~
  y ~ yes ~
  N ~ No ~
  n ~ No ~
{OTHERWISE} ~ Current ~ ~
{LABEL}Yes ~
{STATUS PROMPT}Save File, press ESC when done ~
{PAUSE KEY}{Esc} ~
{STATUS PROMPT} ~
{LABEL}No ~
{Exit}nn{GO}Doit ~
{LABEL}Other ~
{Switch}
{LABEL}Doit ~
{List}{List}R
```



Figure 1: This macro eliminates the need to repeat a retrieve command if you've inadvertently tried to retrieve a file into a WordPerfect 5.1 document window that already has something in it. If WordPerfect asks whether to retrieve a file into the current document, start the macro. You can then specify whether to retrieve into the current document window or the other document window. If you choose to retrieve into the current document window, you have the option of saving the current document first.

SOLUTIONS
The Working Word

the other window. Choose the other window and the macro goes to the label Other, switches windows, and then gives the same commands as the shorter version. (If the other window has something in it, you will wind up back where you started, with the question "Retrieve into current document? No (Yes)"—except that the current document will now be the second document rather than the one you started in. At this point, you can run the macro again.)

If you choose the current window, the macro goes to the label Current to ask whether you want to save the current file before continuing. Answer no and the macro goes to the label No, closes the file without saving, and then goes to the label Doit to load the file into the now-empty window. Answer yes and the macro goes to the label Yes, then pauses to let you save the file under any name or directory. When you press Esc to indicate that you have finished, the macro picks up again, gives the commands to clear the window, then goes to the label Doit, as it did before.

Note how the macro uses the {OTHERWISE} command in both {CASE} statements to trap for errors. If you enter anything other than the expected characters for the {CHAR} statement, the {OTHERWISE} statement branches back to the label just before the {CHAR} statement to ask the question again. If you want to abort the macro, press F1 to cancel.

As always when entering macros in the WordPerfect editing screen, remember that you can't enter the commands in curly brackets by typing them in. To enter the commands that show in uppercase, press Ctrl-PgUp, pick the command you want from the pop-up list, and hit Enter to insert the command into the macro. To enter commands that show in mixed upper- and lowercase and have no function within the macro editor, press the appropriate function keys, such as F5 for {Switch}. For keystrokes that the macro editor recognizes as commands, such as Enter or F7 for {Exit}, press Ctrl-V first and then the command key. Spaces appear as midline dots.

Finally, note that whichever version of the macro you decide to use, you must attach it to an Alt key, since you cannot otherwise start the macro from the List Files screen.

Spell-Checking Doubled Words

Looking for and eliminating doubled words in a document is usually a welcome feature in a spell-checker, but there are some words that are supposed to be doubled. And if you're writing, say, a travel brochure about Pago Pago, the capital of American Samoa, having the spell-checker stop at each occurrence of the name can quickly become a nuisance.

WordPerfect will let you disable the checking for doubled words, but that means overlooking possible mistakes as well as the words you want to skip. However, you can selectively skip the purposely doubled words by separating them with a hard space, entered by pressing the Home key, then the space bar.

*David S. North
Arlington, Virginia*

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SOLUTIONS

The Working Word

► **PC MAGAZINE** While most people probably won't need to sidestep checking for doubled words very often, knowing how to do this can come in handy on those few occasions when the need does arise. The same technique works in Microsoft Word 5.0 and 5.5, Microsoft Word for Windows 1.1, and WordPerfect for Windows, but not in Word for Windows 2.0. Note that the word processors it does work with will still spell-check the words on both sides of each hard space.

To enter a hard space in Word 5.0, use Ctrl-Space. In Word 5.5 or Word for Windows, use Ctrl-Shift-Space. In WordPerfect for Windows, use Ctrl-Space if the package is installed for the CUA keyboard, or use either Ctrl-Space or Home, Space with the WPDOS51 keyboard. Or you can choose Layout Lines Special Codes, select the Hard Space option button, and choose Insert.

Seconds for WordPerfect

To include seconds in time entry for a WordPerfect document, use an amper-

sand when defining the date/time format. For example, if you want to define a time stamp for the current session, press Shift-F5, type Date Format, and then define the format as

8:9:&0

As the Date Format screen shows, 8 represents hours and 9 represents minutes. The & represents seconds, even though it isn't shown as a choice on the Date Format screen. Once the format is defined, you can add the time stamp as usual, with Shift-F5, C (for date code) or Shift-F5, T (for date text).

Debra Euchler
Framingham, Massachusetts

► **PC MAGAZINE** This undocumented feature does not work in WordPerfect 5.0, but it does work in Version 5.1. (Note that the 0 in the example adds *am* or *pm* and is a choice on the Date Format screen.)

Somewhat surprisingly, the ampersand yields seconds in WordPerfect for

Windows as well. WordPerfect for Windows defines date and time formats with codes, such as [Hour(12) #] or [Minute #], rather than arbitrary numbers like 8 and 9. But if you choose Tools Date Format, you'll find that you can type an ampersand in the Edit Date Format text box to add seconds to the format. Be forewarned, however, that because the feature is undocumented, WordPerfect says there is no guarantee that it will be supported in future versions. □

TIPS FROM WORKING WORDSMITHS

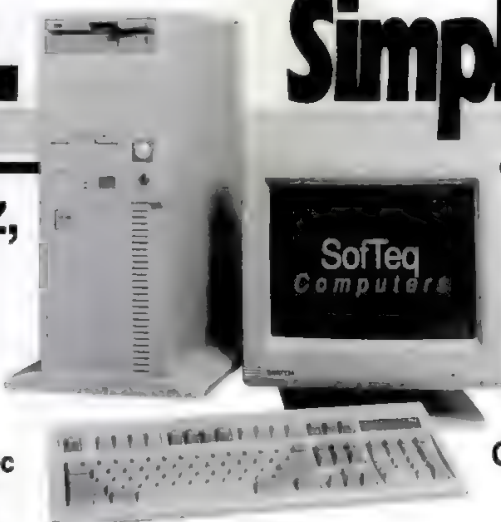
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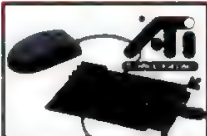


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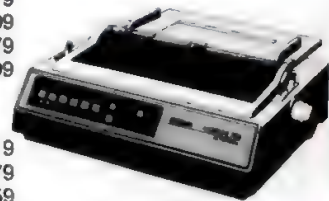
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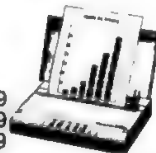
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PC MAGNET

The Best in Shareware: The winners of the annual Shareware Industry Awards.

BY CRAIG KERWIEN

The Shareware Industry Awards is an annual event held to acknowledge excellent shareware. In this column, we list this year's winners. You can find all the programs in the Public Brand Software Forum on ZiffNet (type GO ZNT:PBS).

- **Best Utility:** 4DOS by J. P. Software. 4DOS is a DOS shell replacement for COMMAND.COM. It not only improves almost all DOS commands, but it also lets you alias commands, edit the command line, create 40-character file descriptions, use flexible wildcards, enter multiple commands per line, and much more. You can find its files in the Utilities Library (1) as 4DOS4P.ZIP and 4DOS4D.ZIP.

- **Best Application Software:** As-Easy-As by Trius. As-Easy-As is a spreadsheet program that uses worksheets compatible with Lotus 1-2-3, Versions 1A, 2.0, and 2.01. It's in the Applications Library (3) as ASEASY.ZIP.

- **Best Graphics Application or Tool:** Paint Shop Pro by Robert Voit. Paint Shop Pro is a Windows screen-capture program and graphics-file-conversion

system with powerful image-editing tools. It's in the Graphics Library (4) as PSPRO.ZIP.

- **Best Business and Finance Software:** Medlin Accounting System by Jerry Medlin. Medlin Accounting System is a series of small, fast accounting programs for small to medium-size businesses. You can find it in the Business Library (5) as MEDLIN.ZIP.

- **Best Programming Language or Tool:** A86 by Eric Isaacson. A86 is a fast macro assembler that can assemble your program directly into an executable or create .OBJ files for linking into other programs. A86 is in the Programming Library (10) as A86ASS.ZIP.

- **Best Educational Software:** Animated Series by Tom Guthery IV. The Animated Series is made up of four programs: Alphabet, Math, Memory Game, and Shapes. Designed for preschoolers, each program uses animation and interactive slide shows to invite participation. Look for the files ALPHA1.ZIP, ALPHA2.ZIP, AMATH.ZIP, AMEM-

OR.ZIP, and ANIMSH.ZIP in the Education Library (12).

- **Best Math or Engineering Software:** Kwikstat by Alan Elliott. Kwikstat is a menu-driven statistical analysis system with powerful reporting capabilities. Look for the two files KWKST1.ZIP and KWKST2.ZIP in the Math/Engineering Library (8).

- **Best New Product:** SureFire by Mindy and Peter Makula. SureFire is a word processor that implements "smart document processing," which allows you to build databases and spreadsheets within your word processing document. Look for SUREF1.ZIP and SUREF2.ZIP in the Applications Library (3).

- **Best Home or Hobby Software:** SkyGlobe by Mark Haney. SkyGlobe is a slick stargazer system that covers 9 planets and 89 constellations (about 15,000 stars) shown from the vantage point of more than 125 cities (you can also input your own location). SkyGlobe is located in the Home/Hobby Library (11) as SKYGLO.ZIP.

- **Best Entertainment Software and Best Overall:** Commander Keen Series by Apogee Software Productions and Id Software. Commander Keen is a classic arcade adventure game with Nintendo-like graphics and animation. Download it from the Games Library (13) as KEEN.ZIP.

- **The Peoples' Choice:** 4DOS by J. P. Software. Shareware users from around the world vote for their favorite shareware program. (See Best Utility, above.)

If you don't have a ZiffNet or CompuServe account, you should be able to get any of these programs from your local user group disk library or bulletin board. □

■ ZiffNet on Prodigy

ZiffNet is now available on Prodigy. Select ZiffNet as a Custom Choice, and you can access services such as NewsBytes, ZiffNet Bulletin Boards, and PC Magazine Editorial, including Editors' Choice Awards.

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keyword, then select Download from the menu; the interface software will take care of the rest.

ZiffNet for Prodigy costs \$14.95 per month, which includes 3 hours of use. Additional time costs \$6.00 per hour. These costs are in addition to the monthly Prodigy service membership of \$12.95. To access an interactive demo and to enroll in ZiffNet for Prodigy from the Prodigy service, simply enter [JUMP] ZIFFNET.

—Chris Shipley

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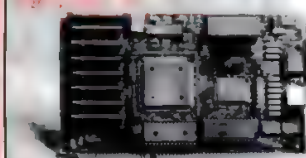
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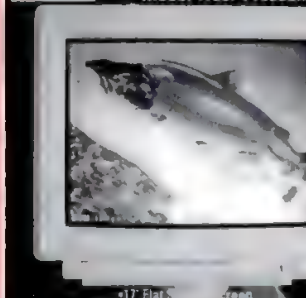
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Microcom QX 4232bis	\$899	YES	YES	NO	NO	NO	NO
Hayes Ultra 14.4	\$999	YES	NO	NO	NO	NO	NO
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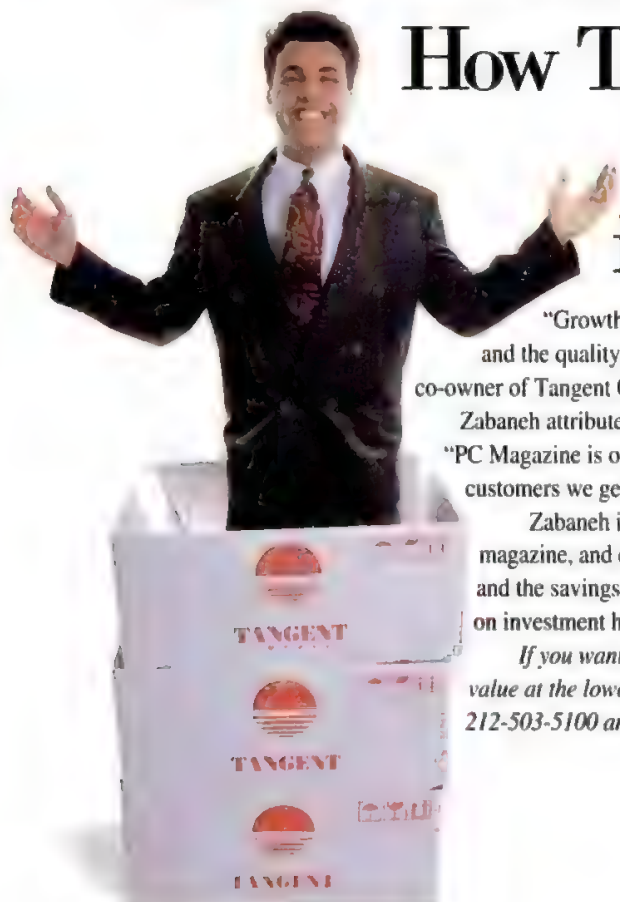
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How Tangent's Success is Paying Off for its Customers

"Growth has allowed us to make a greater investment in technical support, R&D and the quality and reliability of our machines," says Mike Zabaneh, Vice President and co-owner of Tangent Computers.

Zabaneh attributes his greater share of the direct market to his advertising in PC Magazine. "PC Magazine is our single largest lead generator. Even better, the lifetime value of the customers we get through PC Magazine is unmatched."

Zabaneh is a big fan of the PC Direct section. "We had been in the general part of the magazine, and decided to try out PC Direct. There was absolutely no decrease in response, and the savings allowed us to go from a single page to a spread in every issue. The return on investment has been excellent."

If you want to find out how to attract the most new customers with the greatest lifetime value at the lowest possible cost, call your PC Magazine sales representative or 212-503-5100 and ask about PC Direct.



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"When you have an idea this good, you don't want to be shy about it. That's why one of my first marketing decisions was to put a spread ad in every issue of PC Magazine, using the PC Direct section. And it's turned out to be our best lead generator by far.

"The PC Magazine reader is our ideal customer," he says. "PC Magazine brings us the kind of customers we want, those who know that value means more than just a low price.

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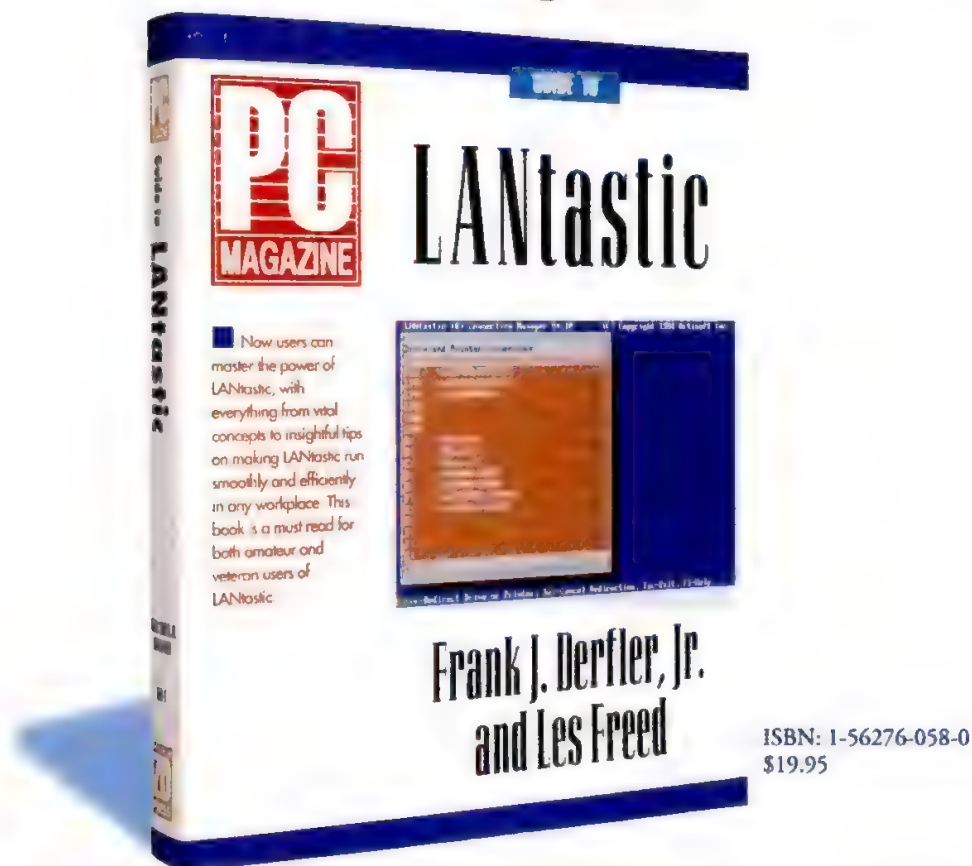
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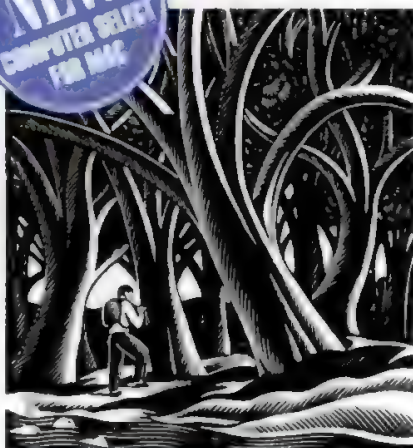
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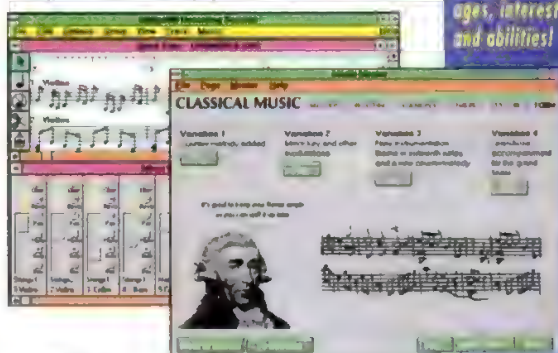
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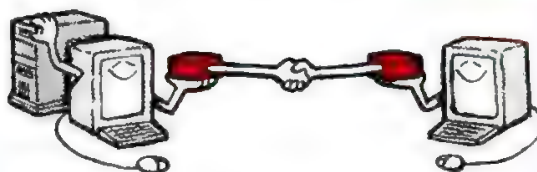
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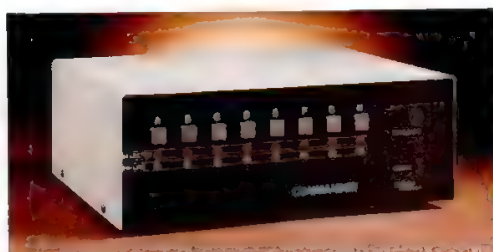
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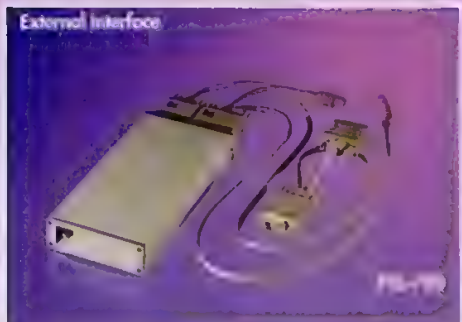
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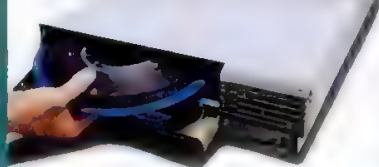
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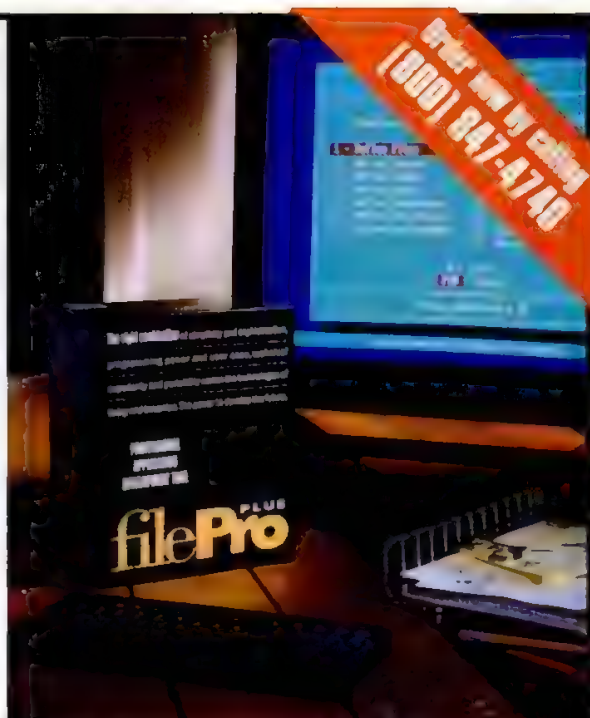


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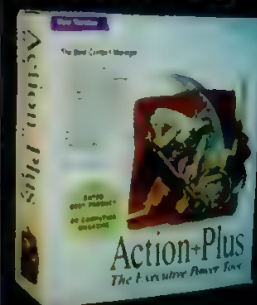
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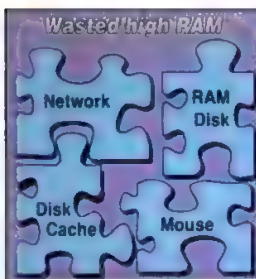


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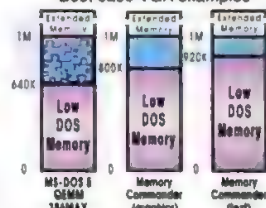
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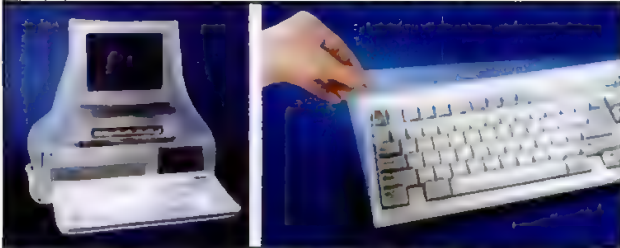
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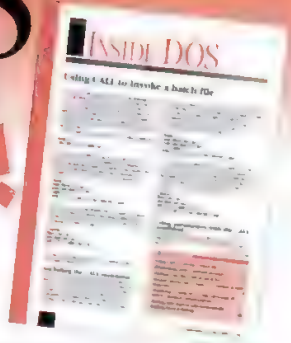
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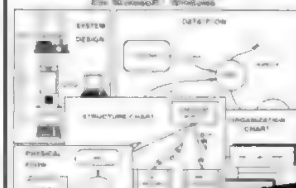
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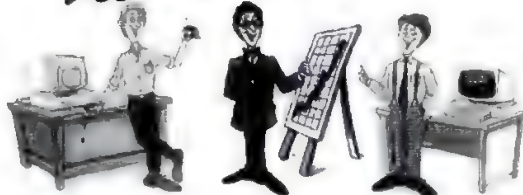
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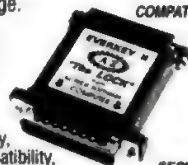
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- an average of \$2,855 per order

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83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

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Calling about an ad?

Say you saw it in

PC Magazine Classified

BAR CODING

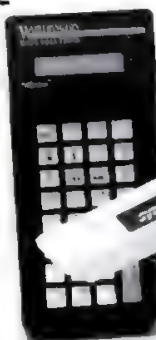
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QUALITY • SERVICE • 800 SUPPORT

LABELS LABELING SOFTWARE

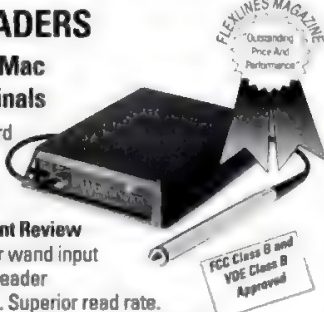
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for PC, XT, AT, PS/2, Mac
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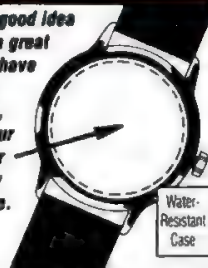
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1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No

2. Please indicate your company or organization's primary business activity: (Check one only)
01. ☐ Manufacturer of Computer Equipment, Computers, Software
02. ☐ Manufacturer—Aerospace
03. ☐ Manufacturer—Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government—Federal
11. ☐ Government—Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture

3. Please indicate your primary business function: (Check one only)
01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
15. ☐ Other

4. In your company a reseller?
01. ☐ Yes 02. ☐ No

5. For how many IBM PCs and compatibles do you specify brands of products:
01. ☐ 10 or less 03. ☐ 25-99
02. ☐ 11-25 04. ☐ 100 or more

6. Are there any PCs in your office? (Check all that apply)
01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply)
01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC Products?
01. ☐ Now
02. ☐ In 4 to 6 months
03. ☐ In 7 to 12 months
04. ☐ No definite plans

9. Number of Employees in your entire company:
01. ☐ 25 or less
02. ☐ 26-99
03. ☐ 100-499
04. ☐ 500-999
05. ☐ 1000 or more

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Coming Up

Software

Ease of use, scenario management, object orientation, and a better connection to databases infuse a new generation of spreadsheets, making today's grids much more than just number crunchers. Next issue, *PC Magazine* scouts out today's most powerful spreadsheets and highlights those yet to come.

Pen Computers

Whether you call them tablets or notepads, this is technology that could shape the future of personal computing. *PC Magazine* looks at eight pen-based PCs to see if their time has come. Included are pen offerings from Dauphin, GRiD, IBM, Momenta, NCR, NEC, ZDS, and Zeos. Look also for emphasis on pen software and pen operating systems.

Presentation Graphics

Thanks to better printed output, scalable fonts, and perhaps most dramatically, multimedia, today's presentation products deliver the goods in ways few could have foreseen. *PC Magazine* reviews 11 presentation graphics packages—some old, some new—and we'll tell you which ones make your demo, sales pitch, or training session look its best.

Graphical Operating Environments

Now that people have had the time to actually use Windows 3.1 and OS/2 2.0, we can finally evaluate what's it like to have them on your desktop. Our labs benchmark-tested the packages and our reviewers lived with them. We report bugs, quirks, and performance, and we pass on tuning tips. We also take a look at DESQview/X, the newest GUI.

Networking: Wiring Hubs

If you want to build a strong enterprise-wide network, a fast file server isn't enough. You've got to have a solid wiring hub behind it, a wiring hub that supports Ethernet, Token-Ring, FDDI, SNMP management, and bridging or routing. *PC Magazine* Labs looks at six wiring hubs that fit this bill and provides the insight you need to pick the perfect hub.

Utilities

Do you find yourself checking your watch every five minutes when you have to attend a meeting, or leave the office at a certain time? Are you so preoccupied with keeping track of the time that you can't concentrate on the task at hand? TIME!, next issue's utility, can help you. TIME! is a countdown timer just like the one in your kitchen, but with three independent timers that you can set, start, and stop. When the time expires, TIME! will beep your speaker.

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MUSIC SOFTWARE:

Cakewalk Professional for Windows, Encore, The Jammer, Power Chords

MUSIC SOFTWARE

Four MIDI Software Packages Scale New Musical Heights

BY ROBERT KENDALL

MIDI, the Musical Instrument Digital Interface, has already infiltrated recording studios. Now, as the interface and software grow more sophisticated and versatile, MIDI is becoming accessible to a wider audience, from teachers to multimedia authors to hobbyists.

The four software packages covered here—Twelve Tone Systems' Cakewalk Professional for Windows, Passport Designs' Encore, Soundtrek's The Jammer, and Howling Dog Systems' Power Chords—all demonstrate MIDI's diversity. Cakewalk, Encore, and Power Chords show the superiority of the Windows environment for MIDI on the PC.

Sequencers, such as Cakewalk Professional for Windows, let you play music on a synthesizer and record your performance as a sequence file. You lay down one track at a time, and edit everything from individual notes to overall tempos. Music notation programs, such as Encore for Windows, transcribe the music you play into conventional staff notation and print out engraver-quality scores.

Two of the programs in this group take an unconventional approach to music making. The Jammer is a composing

program that improvises music on the spot in different styles. It's almost like having live musicians in your PC. Power Chords addresses musicians who prefer stringed instruments to keyboards, turning the PC screen into a graphical guitar.

Making music with your PC is not inexpensive. To get started, you need a sound board with a built-in synthesizer (these start at around \$100) and an amplifier or headphones. Adding a MIDI keyboard for recording can cost a few hundred to several thousand dollars.

Sequencing and notation software prices start at about \$100. If you're serious about music, though, you'll find the extra money well spent on the unbeatable sequencer Cakewalk Professional for Windows (\$349), or the superb notation package Encore (\$595).

In this set of reviews, you'll get a sampling of the range of MIDI products available. Other options include Midisoft's Studio for Windows, Coda Music Software's Finale, and Passport Designs' Master Tracks Pro. (For more information on sequencers, see "MIDI Software: MIDI Goes Mainstream," PC Magazine, March 31, 1992.)

TWELVE TONE SYSTEMS' CAKEWALK PROFESSIONAL FOR WINDOWS

After dominating the DOS sequencer market for years, Twelve Tone Systems seems destined to take over the Windows world with Cakewalk Professional for Windows. This new GUI powerhouse is among the easiest, most powerful, and flexible sequencers.

The program provides all the recording flexibility you could desire. Its biggest strength, though, is its unmatched array of graphics tools for viewing and editing your music. Cakewalk makes fine use of zoomable windows, which give you several views of your music. Track sheet, piano-roll editor, and traditional notation windows can appear on the screen at once.



Cakewalk Professional for Windows displays a bird's-eye view of your sequence and staff notation in separate windows.

An unusually flexible track-sheet window provides a bird's-eye view of everything. You specify parameters for each track, such as patch (instrument sound), panning, volume, or transposition. The right half of this window depicts each measure as a small box. You can select sections

across several adjacent or non-adjacent tracks at once, and edit them globally or drag them to new positions.

For editing notes, you can work with conventional staff notation or a piano-roll editor that depicts notes graphically on a grid. The staff notation window displays up to ten tracks at once on different staves and lets you insert or change notes. The piano-roll editor is very easy to use, since you can drag or stretch notes with the mouse to change positions and durations.

Both modes have some limitations, however. The staff notation mode can't handle triplets or print a score, for instance. Selecting groups of notes for editing in piano-roll mode also isn't as flexible as it could be. You can't edit a bass line by drawing a selection box to choose only the lowest notes of all the chords in a bar.

Cakewalk's use of graphs provides another intuitive way to grasp the musical data. In the bottom half of the piano-roll window, you can display the key velocity values (volumes) of your notes as vertical bars. A separate window graphs continuous controllers (MIDI messages that govern volume, sustain, and other effects). For example, a crescendo appears as vertical-bar graph, in which each bar is taller than the previous. Tempo changes appear in a line graph. To create a gradual increase or decrease in volume or tempo, you just drag the cursor along the

Cakewalk for Windows

graph. The program adjusts the lengths of all the bars or the curve of the line to follow the movement of the mouse.

Yet another window depicts 16 faders and provides an alternative method of working with the continuous controllers. You can associate each of the faders with any track and controller. The faders move during playback in response to controllers in the music; you can add new controllers by moving the faders with the mouse during recording. This

is a great way to create fade-ins and fade-outs.

Cakewalk Professional for Windows' powerful event filter for globally editing MIDI data is one of its greatest strengths as well as one of its weaknesses. It can accent the first beat of every bar, turn melodies upside down, or compress a dynamic range (making the loud notes softer and the soft notes louder). Unfortunately, the feature is inadequately documented and confusing to use, often complicating simple tasks.

This program taps some of

Windows' non-MIDI music potential as well, redefining the role of the sequencer. From any point in your sequence you can play Waveform digital audio files. You can also send Windows Media Control interface commands to control a CD-ROM drive or VCR that responds to these messages.

Other attractive features include context-sensitive help (too often neglected by Windows music software) and a powerful but arcane script language. Twelve Tone even provides Windows drivers for the

Roland MPU-401 and Music Quest interface boards that let two or more programs access the MIDI output port simultaneously. If you have either of these boards, you can open a multimedia package to play your MIDI file without having to close Cakewalk.

Cakewalk Professional for Windows stands at the head of its class. No other PC sequencer offers so many different ways to view and edit musical data. Cakewalk 1.0 gives you the best control over every aspect of your music.

■ **Romeo Libraries:** *MIDI for Classical Music Lovers*

For years, rock and jazz musicians who wanted songs in a format their sequencer understood could turn to any of several huge libraries of MIDI files. Rarely have classical music lovers had such an opportunity. Romeo Music International's MIDI Editions fill that void, with a huge selection of the classics in Standard MIDI file format.

The Romeo collection consists of three multivolume series. Each series has a slightly different use, but every sequence includes each note of the original piece, with each instrumental part of large orchestral works on a separate track.

The 16-volume MIDI File Score Series includes three complete piano sonatas and the first movement of the Symphony no. 5 by Beethoven, all of Bach's *Well-Tempered Clavier*, and orchestral favorites such as a version of Mussorgsky's *Night on Bald Mountain*. Other offerings include Renaissance choral music and orchestral and keyboard music spanning three centuries.

This series is intended mostly for study purposes. The notes are quantized so they line up with the bar lines. The inclusion of some tempo changes makes the music sound less wooden, but the sequences usually won't pass for live performances.

Each of the 12 volumes in the MIDI File Library Series comes with a book and a disk. Several of the books cover the great composers (including Bach, Beethoven, Chopin, Debussy, Liszt, Mozart, and Satie); others are studies of musical styles. The se-

quences on the accompanying disks illustrate the books.

The MIDI File Concert Series (just a single volume at review time) captures unedited live performances by concert artists. Included are Chopin nocturnes, classical guitar music, one of Beethoven's later piano sonatas, and a complete Mozart piano concerto. The concerto sounds a little ragged at times, but the other performances are of high caliber.

All the sequences conform to General MIDI in their patch layouts, so they'll sound correct on an MPC-compatible sound card or a Roland GS Series synthesizer. On a Roland Sound Canvas the keyboard and guitar music sound great, but no one will mistake the orchestral sonorities for the Berlin Philharmonic or be fooled by the synthesized choir "aahs."

The volumes are priced so that you pay a very reasonable \$3 to \$9 per sequence, depending on length. In addition, Romeo Music offers some discounts to the education community. For classical music lovers, it's money well spent.

Romeo Music MIDI Editions: MIDI File Score Series, \$49.95/vol.; MIDI File Concert Series, \$39.95/vol.; MIDI File Library Series, \$29.95-\$79.95/vol. Requires: Sequencing software. *Romeo Music International, 214 Lincoln St., #104, Allston, MA 02134; 800-852-2122, 617-254-9109; fax, 617-254-9170.*

Circle 473 on reader service card

Cakewalk Professional for Windows, Version 1.0, \$349. Requires: 2MB RAM, 2MB hard disk space, Microsoft Windows 3.1, MIDI interface and synthesizer. *Twelve Tone Systems, P.O. Box 760, Watertown, MA 02272; 800-234-1171, 617-926-2480; fax, 617-924-6657.*

Circle 469 on reader service card

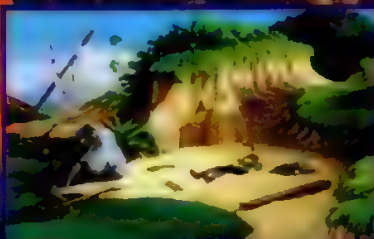
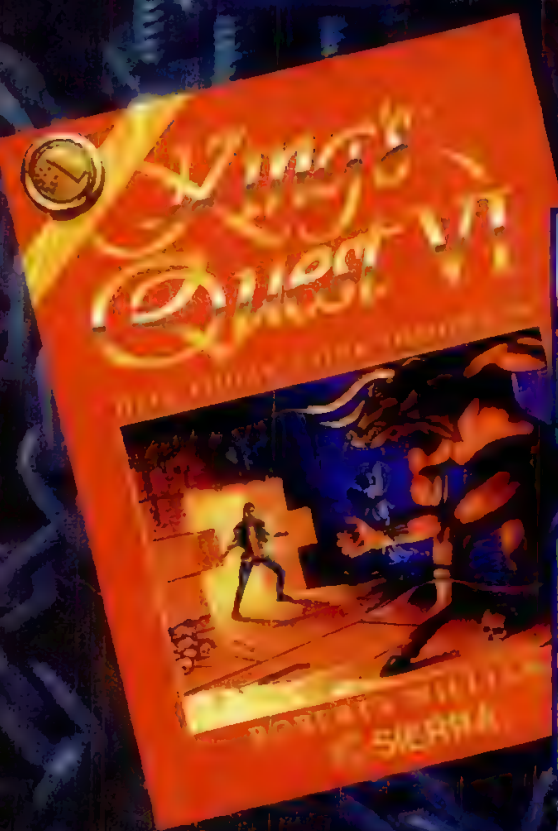
PASSPORT DESIGNS' ENCORE

Like many of the best music programs for the PC, Passport Designs' Encore started out on the Mac. Encore for Windows now gives PC users a versatile music notation tool that admirably couches its great power in an accessible interface.

It's a straightforward process to lay out just about any type of music, ranging from a lead sheet with lyrics and chord symbols to a 64-staff orchestral score. You can enter music in just about any way imaginable: by placing notes on the staff with the mouse, playing on your MIDI keyboard in either step time (one note at a time) or real time, or importing sequence files in Standard MIDI or Master Tracks Pro format.

Encore's excellent integration with MIDI makes it an ideal tool for composers and

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Encore

arrangers. When Encore transcribes real-time MIDI input or a MIDI file, it quantizes the music; that is, it aligns notes so they fall on the nearest subdivision of the beat you specify to keep the performer's expressive rhythmic inflections from introducing notational inaccuracies to the score. Try out different quantizations on different parts of the piece until you get the results that you want.

Encore will play your score back on a MIDI synthesizer, preserving imported patch changes (instrument sounds), volume levels, and MIDI channel assignments or letting you select new ones. Encore's playback won't follow dynamic marks or repeats that you add, however.

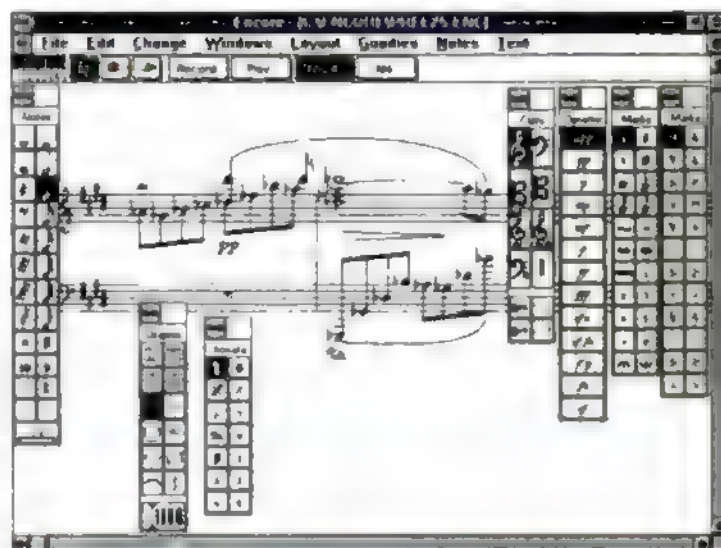
Encore's use of the Windows interface makes editing easy. The program aligns and beams notes quite well, and it's easy to drag notes or bar lines to the left or right if you need to do any fine-tuning. You can cut and paste notes to transpose or relocate them. Expression marks and lyrics stay anchored to the notes when they're moved.

To add dynamics, slurs, articulation, and other marks, you just have to select the symbol from one of several floating palettes. If you want to attach articulation marks to notes, simply click on a note head; you can create slurs or hairpins by clicking on beginning and end points.

Aligning lyrics with notes is simply a matter of typing each syllable and then tabbing to the next note. You can add chord names or guitar finger-board chord charts that will change to follow any trans-

positions you make. There's a feature designed to parse chords you play on your MIDI keyboard and add the appropriate chord symbols to your score, but it was crippled by bugs in the release we tested. The vendor promises a fix.

Automatic title positioning and bar numbering, as well as



To place notes, expression marks, or other musical elements on the staff, select them from one of Encore's floating palettes.

a wide range of staff size options and good font control, help ensure stunning printed output. You can also extract parts from a full score.

Encore can handle most notational complexities. For contrapuntal music, you can create up to four independent voices per staff. Grace notes, tremolo, and alternative note heads for percussion and harmonics are all available. Some things are beyond the program's reach, though, such as polymeters (different meters in different staves).

In some respects, Encore falls short of Coda Software's Finale—currently the most powerful program on the market. But this product is much easier to use, a little bit cheaper, and has the benefit of remarkably snappy redraws. If you don't need all the power of Encore, there's a scaled-down version called Music-Time for \$249 that supports only six staves, can't extract parts, and forgoes a few other features.

Encore for Windows, \$595
Requires: 2MB RAM,
Microsoft Windows 3.1 or
higher. MIDI interface and
synthesizer optional. Passport
Designs, 100 Stone Pine Rd.,
Half Moon Bay, CA 94019;
415-726-0280; fax 415-726-
2254.

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SOUNDTREK'S THE JAMMER

Heading up your own band is easier than you might think, if you have Soundtrek's The Jammer. Using randomization functions and musical algorithms, this DOS program composes a musical backup for you on the spot and plays it on your synthesizer. Musically, the results are surprisingly convincing and varied.

Though The Jammer composes the music, you have as much control as you want. You can choose the patches and change the size of your band, filling up to 256 tracks.

You can select from dozens of styles including jazz, blues, pop, country, bluegrass, bossa nova, funk, you name it. Each time you hit the Compose key, The Jammer spits out drum, bass, piano, and rhythm guitar parts in the style you chose, each on its own track. A part can even alternate between styles for variety.

You can give the different rhythm, bass, and percussion parts their own personalities by customizing the rules that each follows. You also specify the pitch range, picking and strumming patterns, and types

of bass lines for each.

Meter and tempo are at your command, as are the rules for generating chord progressions. You can opt for simple triadic harmonies, complex jazz chords, or anything in between. If you're after an accompaniment to a specific song, just type in its harmonies instead of asking The Jammer to create its own.

You can save different sections and piece them together into a song, and you can go back anytime to recompose a few bars or just a single track. With your MIDI keyboard, you can also record your own melody parts.

You can save your creation as a standard MIDI file. If you want to edit the tracks, however, you'll need a sequencer. Once you're satisfied with the score, you can incorporate the music into a multimedia presentation or use it in any other way you wish. The vendor places no restrictions on how you use the music you and the program have created.

This program's text-mode interface isn't very elegant, and composing isn't always as



With The Jammer, you set the rules that the program uses to create chord progressions.

intuitive as it should be. Nonetheless, The Jammer is fairly easy to learn and straightforward to use. The Jammer is more than just a great source of entertainment for music lovers. It can be a help to composers who want to try out

The Jammer

ideas quickly, and performers may find it a useful aid to rehearsing.

The Jammer, Version 1.4, \$175. Requires: 640K RAM, 2MB storage space, DOS 3.1 or later, Roland MPU-401 MIDI interface or compatible, MIDI synthesizer. Soundtrek, 3384 Hill Dr., Duluth, GA 30136; 404-623-0879.

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HOWLING DOG SYSTEMS' POWER CHORDS

Unlike most MIDI software, which is geared toward keyboard players, Power Chords from Howling Dog Systems has the guitar player in mind. This Windows program, with its slick, object-oriented interface, turns your PC and synthesizer into a virtual guitar.

There's an excellent interactive tutorial to get you going, and you can export finished songs as standard MIDI files.

You create chords by clicking on the frets of a graphical guitar fingerboard. This generates fingerboard chart symbols that you can drag into different measures of a song to create its harmonies. You simply type chord names to have the program build the draggable fingerboard charts for you, and you can customize the number and tuning of the program's graphical strings.

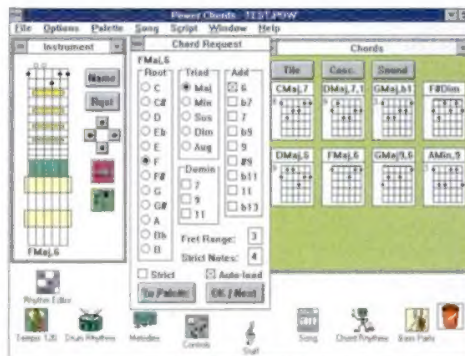
To sound the chords in your song, you fashion picking or strumming patterns using a graphical depiction of guitar strings. You can save different patterns as icons and then drag

them into your song below the chord charts.

You can add separate bass and melody lines and even create a drum track to complement your guitar plucking. Simply click notes into a grid whose rows represent different parts of the drum kit. The program's piano-roll note editors help you create the bass and melody lines, or you can

record the lines with a MIDI instrument. Again, you drag each finished musical component into your song as an icon.

With the unique approach taken by Howling Dog Systems' Power Chords, MIDI becomes amenable to musicians who want to incorporate the guitar and other stringed instruments into their compositions. □



Power Chords creates chord charts when you click on the graphical guitar's frets or enter a chord's name in the dialogue box.

Power Chords, Version 1.0, \$84.95.

Requires: 2MB RAM, Microsoft Windows 3.0 with Multimedia Extensions or Windows 3.1, MIDI interface or synthesizer; mouse recommended. Howling Dog Systems, Box 80405, Burnaby, BC, Canada V5H 3X6, 604-436-0420; fax, 604-436-0425.

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Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Bill Howard

His Wish Came True

From the *Seattle Post-Intelligencer*,
August 14, 1992:

"Larry Anderson offers his report from last week's 50th reunion of Lincoln High School's class of '42:

"Duncan McGibbon, who said in the high school annual that he intended to be 'an anarchist,' is a retired senior planner for IBM. . . ."

Dear Mr. McRay:

Thank you for your letter about the Macros you have written for Writers. I am sorry to inform you that WordPerfect prefers to create their own macros to distribute. We do not purchase other companies ideas or sell their products with ours. I would encourage you to market your own product as you feel many would benefit from your experiences & the product you have produced.

Thank you again for thinking of us, but at present we do not market other products with ours.

Sincerely,



John Miller


Rejection letter
from WordPerfect
Corp. to a would-be
outside developer.

Thanks but the In-House Talent Is Adequate

This shows why word processors could use grammar checkers as well as spell-checkers, although even grammar checkers might not be helpful in determining whether WordPerfect is an *it* or a *they*.

Press Releases We Never Finished Reading

"For Kennelwood Village, a 500-room pet motel in St. Louis, tracking appointments for its furry clientele was quite a howl. About 175,000 reservations, cancellations and scheduling changes—up to a year in advance—are made annually, and the in-house computers weren't handling the job.

"A consultation with Compet Systems, Inc. provided the answer: IGC's VM/386 MultiUser, a powerful PC-based multitasking system which links up to 32 users. . . ."

—IGC PRESS RELEASE

 **COWDEX**
Spring



Network World
(April 13, 1992)
took a farmer's-eye view of Spring
Cowdex.

Further Proof that the Good Names Are Already Taken

STSC, of Rockville, Maryland, maker of decision support and statistical analysis software (Statgraphics, APL Plus), changed its name to Manugistics, in order, the company said in a press release, "to reflect the evolution of the company's business over the past decade."


Manugistics™
working as one

Water-Seeks-Its-Level Dept.

IBM is selling a discontinued version of the PS/2 L40 SX laptop through the Home Shopping Network.



If your entry is used in *Abort, Retry, Fail?* we'll send you \$50 and a *PC Magazine* T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of each entry are considered. Winners this issue: Mike Cohn (IBM anarchist), Paul McRay (WordImperfect), Donald P. Willmott (press releases we never—ah—quite . . . yawn), Keith McMaugh (Cowdex).

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MURPHY'S LAW #43

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MURPHY'S LAW #17

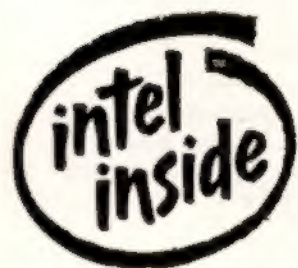
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